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CHILD DEVELOPMENT

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INTRODUCTION

In the first article Line and Kaplan offer stimulating suggestions for the analysis of the factors operating in the I.Q. increases of preschool children. Langhorne's study of a special skill is a contribution to educational psychology and organismic theory.

The next five studies illustrate the research fertility of the early childhood years. Jersild and Holmes report a study of children's fears which is directly comparable to Hagman's article in the December, 1932 issue of this Journal. Strangeness, unexpectedness, pain, animals, and loud noises appear frequently as basic factors. Brackett found the nursery school an excellent place to observe laughing and crying behavior. Skeel's work on form discrimination, here reported, may be considered supplementary to his major contribution in the adaptation of form board materials to the preschool age. By painstakingly repeating the earlier work of Chase on the motivation of preschool children, Anderson and Smith are able to show important constants in child reactions. Robinson and Conrad help to establish the limits of the "short time sample" technique with preschool children.

In a first study of the question, Vance and others show that most of the criticisms of home management demonstration centers are not supported by objective evidence. Fitz-Simons reports the development and use of a rather elaborate scheme for assisting clinical workers to estimate parental attitudes. The guide itself is reproduced here in complete form. That mazes can be constructed appropriate not only to child interest but to the study of fundamental problems in child psychology is demonstrated by Wenger.

George D. Stoddard

George D. Stoddard

December, 1933 Volume II, No. 2

VARIATION IN I.Q. AT THE PRESCHOOL LEVEL

by
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Wellman's recent publications (10, 11) dealing with the effect of preschool training upon the I.Q. have naturally aroused a great deal of interest. Her findings are exceedingly challenging, reopening as they do many questions concerning the nature of intelligence that have, in some circles, seemed to be closed. Variation in I.Q. modifiability of g together with the matter of the limits within which any variation may occur, if such variation be ever definitely established, are problems of vital significance to the psychologist; while to the educationalist the stimulating conditions under which increase in basic mental caliber may be expected, and the value of such increase, offer much scope for speculation and research.

Interpretations along these broad lines, however, are very difficult to establish and are obviously premature in the light of any existing data. Indeed, they may be positively harmful, particularly if they assume an air of finality which would inhibit the search for more detailed facts. Much further information is needed concerning the supposed constants of mental measurements, and available techniques must be considerably refined before the complexities of mental development can be understood sufficiently to warrant definite educational conclusions. Consequently, we find a number of investigators searching for other apparently abstract facts and factors, all of which will eventually contribute to the interpretation of data such as Wellman has so strikingly presented.

In this connection the work of Slocombe (4, 7) is particularly significant. Examining (7) some of the data published by Baldwin and Stecher (1), he was able to detect the presence of two group factors in the results of repeated Binet tests and to determine the sphere of influence of these factors to some degree. Increase in I.Q. ratings over a long period of frequent retesting might be due, he concluded, to the variation of these group factors or to the variation in the intelligence ratio. If the latter was true, his data were inadequate to establish this fact.

For some time the first author (2, 3) of the present paper has been advocating the necessity of keeping an open mind not only concerning the constancy of the I.Q., but also concerning the whole question of the growth of g. In addition to inadequate evidence that g increases with age, there exist important experimental findings suggesting constancy of g despite increasing age of peculiarities of training. Now any interpretation of the I.Q. concept is obviously dependent upon the basic facts of g. Consequently, the calling into question of the almost traditional growth curves goes hand in hand with any revision of our notion of I.Q. constancy made necessary by recent data. Interest in closely allied problems, therefore, together with the privilege of association with Miss Wellman on the staff at the University of Iowa (Summer Session, 1930 and 1932) led to the following evaluation of a small part of the data amassed by her over a number of years.

EXAMINATION OF SOME DATA SHOWING VARIATION IN I.Q.

From Wellman's files, fifty-four case histories were selected for examination. The sole criterion of selection was that each case had a Binet test record of at least five tests, the first of which had been given before the age of three years.[1]

1. For the mental age range zero to three years, Wellman had used the Kuhlman revision of the Binet test. In all other cases the Stanford revision was employed.

A preliminary examination of the data thus available consisted in calculating the intercorrelations of the first to the fifth I.Q. ratings of these cases irrespective of the intervals between retests. (In most cases these intervals were approximately six months.) The results are given in Table I.

TABLE I

INTERCORRELATIONS BETWEEN THE INTELLIGENCE QUOTIENTS SECURED FROM RETESTS

Intelligence Quotient	Intelligence Quotient				
	1	2	3	4	5
1		.74	.62	.56	.46
2	.74		.79	.76	.61
3	.62	.79		.81	.70
4	.56	.76	.81		.78
5	.46	.61	.70	.78	

It will be noted that the correlations r_{12}, r_{23}, and r_{34} show a slight tendency toward progressive increase. The sequence r_{12}, r_{13}, r_{14}, and r_{15} shows a decided decrease. In general, the nearer together the I.Q. determinations are in the series of retests, the higher the correlation. Further, equiproportionality is not characteristic of the entire table of correlations, since the tetrad difference $r_{12} \cdot r_{45} - r_{15} \cdot r_{24}$ has the value .23 ± .04. There appears, therefore, to be a suggestion of corroborative evidence regarding Slocombe's finding referred to above.

The next step was to secure I.Q. ratings approximated from the data that would represent the I.Q.'s of the children at the same age so that the intervals between I.Q. determinations would be six months in every case. To do this, a chart was made divided into columns representing the age intervals two years to two years, three months; two years, three months to two years, six months; etc. The I.Q.'s obtained by the test procedure were inserted for each child in the columns corresponding to his age at the time of the examinations. On the basis of the variation in I.Q. shown by any particular child, an approximate I.Q. value was inserted in all columns. Thus, if a child at two years, three months made an I.Q. score of 100 and at two years, nine months made a score of 104, the value 102 was inserted in the column corresponding to two years, six months. Where undue approximation was necessary, the cases were discarded. By averaging the successive pairs of values thus obtained, approximate I.Q.'s at two years to two years, six months; two years, six months to three years; etc., were determined.

The gains in I.Q. are shown in Figures 1 and 2 on the following page. Figure 1 shows the scores at the various six month periods obtained by the upper 25 per cent, middle 50 per cent, and lower 25 per cent of the cases classified on the basis of the first I.Q. rating. It will be seen that the gain is most marked in the lower group. Figure 2 is based on the same data but shows the mean gains in I.Q. for these groups cumulatively. The figures (10, 11) are very similar to those already published by Wellman.

These approximate values were then used in the calculation of correlation coefficients of forty-eight cases. The results are given in Table II.

TABLE II

INTERCORRELATIONS BETWEEN THE INTELLIGENCE QUOTIENTS OF CHILDREN AT THE SAME AGE LEVEL

Intelligence Quotient	Intelligence Quotient									
	1	2	3	4	5	6	7	8	9	10
1		.79	.71	.62	.49	.48	.48	.43	.43	.43
2	.79		.87	.71	.54	.52	.51	.50	.50	.45
3	.71	.87		.88	.73	.69	.67	.62	.61	.56
4	.62	.71	.88		.90	.92	.87	.86	.76	.73
5	.49	.54	.73	.90		.96	.89	.86	.80	.79
6	.48	.52	.69	.92	.96		.92	.90	.84	.80
7	.48	.51	.67	.87	.88	.92		.97	.92	.88
8	.43	.50	.62	.86	.86	.90	.97		.96	.93
9	.43	.50	.61	.76	.80	.84	.92	.96		.96
10	.43	.45	.56	.73	.79	.80	.88	.93	.96	

As seen in Table I there appears to be a lowering of the correlation coefficient as the interval between tests is increased and a progressive increase in the reliability as shown by correlation of the results of first and second, second and third, third and fourth, etc., to the ninth and tenth tests.

Analysis of Table II by Thurstone's multiple factor technique (9) was not very satisfactory, since only one factor could be readily considered.[1] The loadings of

1. It will be seen from what follows that only one factor, general to the table of correlations, need be postulated, plus one (or perhaps two) group factors pertaining to some variables but not to all.

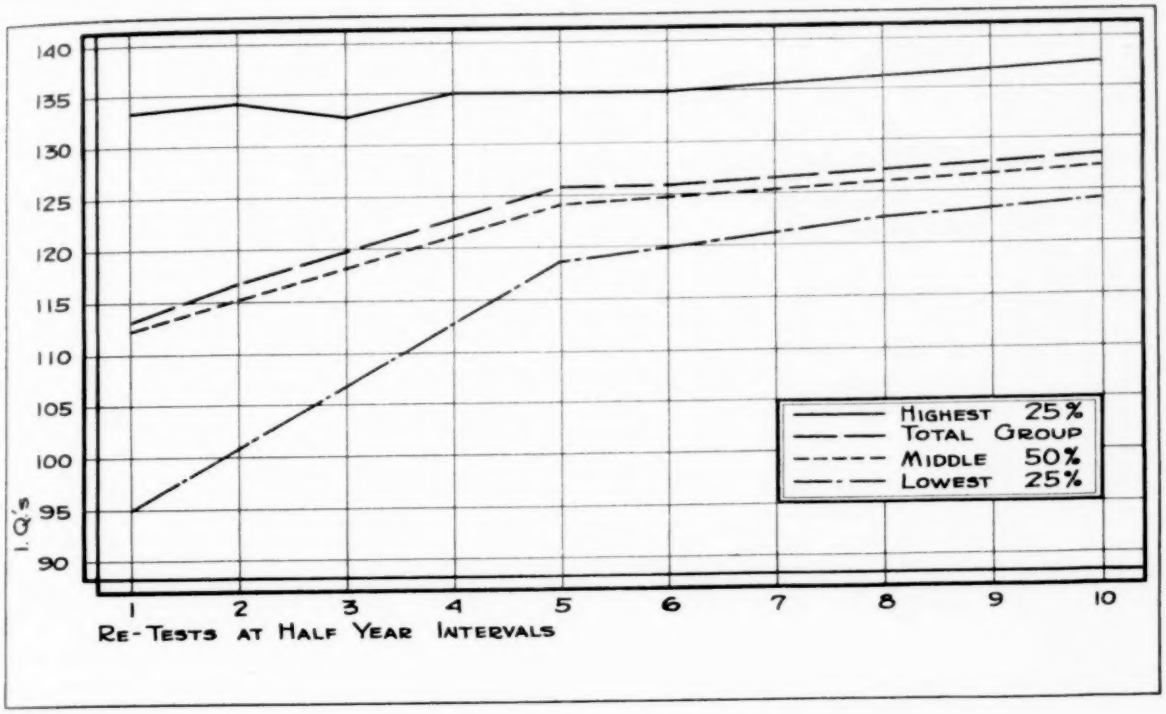

Figure 1. Showing Averages in I.Q.

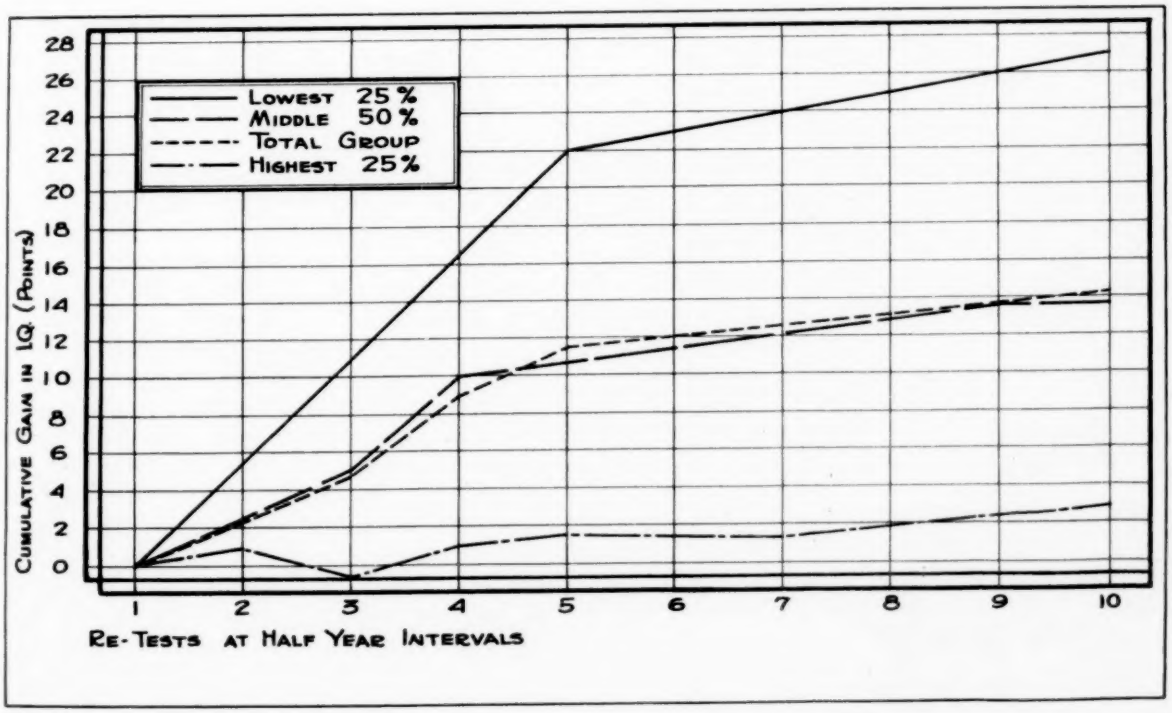

Figure 2. Showing Cumulative Gains in I.Q. (Averages)

the ten variables with this factor, however, were respectively .68, .74, .85, .95, .92, .93, .93, .93, .90, .87, showing an increase up to the fourth variable, followed by a fair degree of constancy.

Tetrad analysis showed the presence of many significant tetrad differences, as Table III distribution indicates:

TABLE III

ANALYSIS OF TETRAD DIFFERENCES

Frequency	Tetrad Difference
3	.550 to .649
28	.450 to .549
49	.350 to .449
64	.250 to .349
86	.150 to .249
148	.050 to .149
504	-.050 to .049
148	-.150 to -.049
86	-.250 to -.149
64	-.350 to -.249
49	-.450 to -.349
28	-.550 to -.449
3	-.650 to -.549

This distribution is far from normal and includes such tetrad differences as $r_{12} \cdot r_{910} - r_{110} \cdot r_{29}$ which has the high value of .544, and $r_{12} \cdot r_{910} - r_{19} \cdot r_{210}$ with the value .566. Inquiry as to the variables involved in the significant tetrad differences reveals the fact that numbers 1, 2, and 3 and numbers 8, 9, and 10 are particularly concerned. Thus, our findings again appear to be in accord with those of Slocombe (6, 7), who located his group factors in the early and late retests. But the main variation from equiproportionality in the preceding tabulation appears to be due to the first three variables, so that we may at least deduce from our data the presence of an important group factor underlying the early tests given under the conditions here obtained.

DISCUSSION

The main findings here presented may conveniently be summarized at this point. They are as follows:

1. Increase in I.Q. is greater for those who originally appear to be less intelligent.

2. The test results become more reliable as the number of retests is increased (at least up to four or five retests).

3. An important group factor underlies the intercorrelations of the earlier test results.

Consistent with our introductory statement, we must leave any definite interpretation until many additional facts have come to light. But some directions in which further research might profitably be undertaken are indicated by the above findings. We may, therefore, discuss these briefly.

The first important task seems to be the identification of the group factor detected in the data. This identification may take the form of more careful statistical isolation, so that any changes manifested by it as the number of retests is increased may be measured. It may then well be, as Slocombe (6) suggests, that the increase in I.Q. is largely dependent upon the development of this factor, either during the testing operations or in the wider social environment of the preschool. The identification could also be carried in the direction of psychological processes, in order that the relationship between the development of the factor and the stimulating conditions might be interpreted in terms of function. An example of this would be the discovery that the factor corresponds to the ability to perceive the psychological relation (relation of objectivity) (8). The writers feel that this latter is probably the correct interpretation, since the social demands of the preschool are such as to cultivate this factor much more rapidly than would likely be the case in an extra-school environment. The brighter children have developed this phase of social adjustment sufficient for testing situations before entering the preschool or very soon after. By the time that individual differences in respect to this factor have been overcome by training, the I.Q.'s as measured cease to show any marked increase. Should this tentative conclusion be substantiated by further research, an objective measure of one phase of preschool education would be made available.

It would further be interesting and significant to determine whether the phenomenal increase in I.Q. displayed by the preschool children (particularly those who are at the lower end of the intelligence distribution of the preschool cases) is phenomenal only in the sense that it appears earlier than for nonpreschool children. Should it be found that the curves for the two groups take the forms shown in Figure 3, the educational interpretation would be much more difficult than the psychological. The latter would be concerned only with the functional identification (in all its aspects) of the factor or factors manifesting the increase, as has been outlined above. But the educational evaluation would involve such conundrums as the relative values of early and later development of this sort, and the criteria of evaluation are exceedingly complex.

A final word may be added concerning the contribution that psychology should make to the establishing of criteria whereby educational evaluation may be assisted. The complexities of the problems here discussed make clear the fact that nonfunctional concepts such as the I.Q. do not in themselves offer the necessary basis for judging educational efficiency. Increase in I.Q. need not mean excellence of training. But once such increase is interpretable in psychological terms, so that the functional characters are disclosed, we have an understanding of it that is more directly connected with our knowledge of human development and our philosophic expressions of educational aims. The perfect correlation of development thus depicted and the best expression of educational value that we have would then be a practical goal for which to strive.

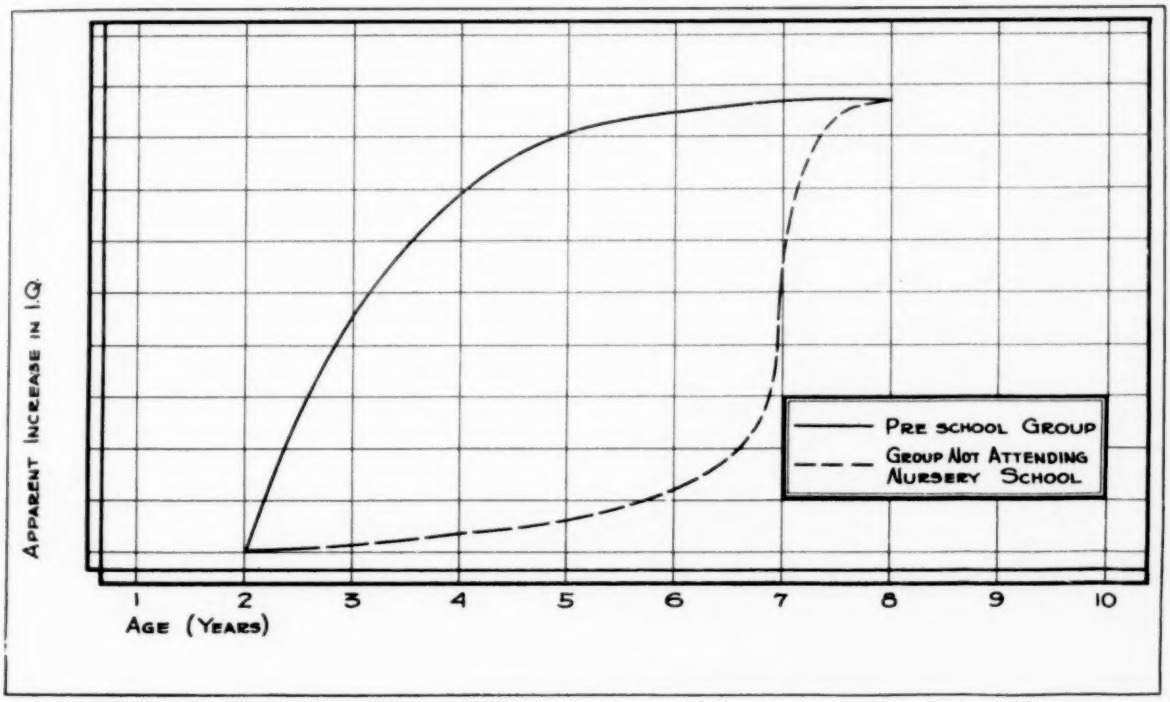

Figure 3. Apparent Increase in I.Q. for Preschool Group and Group Not Attending Nursery School.

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AGE AND SEX DIFFERENCES IN THE ACQUISITION OF ONE TYPE OF SKILLED MOVEMENT

by
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The lack of knowledge as to the part that the nervous system plays in learning has long been a hindrance to the development of learning theories. The psychologist has had to wait until the physiologist, the biologist, and the other scientists have learned more about the nature of the nervous impulse and its conduction through the nervous system before he could relate his objectively derived data to a physiological background.

In recent years several studies (1, 7) have been made which have shown new facts regarding the growth of the brain and the development and differentiation of its function. Closely related to this new body of anatomical and neurological facts is the important psychological problem, the relation of the age of the learner to the rate and limits of the acquisition of skill. At what age, for example, is it best to begin the study of the violin, to begin the mastery of a set of golf clubs, to begin the acquisition of any skilled act?

Examination of the literature and consultation with teachers and professional men give considerable differences of opinion and not much real information as to the part that maturation and learning play in acquiring skills. Many of them hold to the doctrine of James that there is an optimal time for the putting on of specific habits and that one should "strike while the iron is hot"; or they hold to a rather hazy doctrine of physiological and psychological maturation.

It is impossible to present the whole literature on the nature-nurture problem, but a few noteworthy studies may point to certain trends. Experimental contributions beginning with Spalding (8) emphasized the influence of maturation when he found that fledgling sparrows which were not given the opportunity of flying until they had reached a certain age flew on the first attempt. Yerkes and Bloomfield (11), in their experiment on the rat-killing activities of kittens, employed a somewhat similar interpretation when they explained their results in terms of the instinctive patterns of the kittens.

Carmichael (2) neither proved nor disproved the function of maturation in his work on the amblystoma, but Coghill's (3) work has been interpreted as evidence for maturation.

Recent studies point toward learning as the predominant factor in the appearance of behavior patterns. Kuo (5) reared kittens in the laboratory and observed them closely when rats and mice were introduced into the experimental situation. He stated, "Our study has shown that kittens can be made to kill a rat, to love it, to fear it, or to play with it." (5, p. 34)

Witty and Lehman (10), in a recent comprehensive review of a large number of studies on the instinct-maturation problem, reached conclusions which express the beliefs of a number of psychologists. They said,

> "In their zeal to abandon and deny the term 'instinct,' many are today substituting the term 'maturation.' Perusal of the contradictory findings indicates that the term maturation is proving as flexible and as obscure as was the term instinct. J. B. Watson states that he is not quite sure what is meant by the term maturation....and Pratt, Nelson and Sun wrote that when we say well-coördinated reactions appear as a product of growth and maturation, this

1. The writer wishes to acknowledge the coöperation of Dr. C. H. Calhoun, F. P. Bakes, and the seventy-eight children of the Ohio Bureau of Juvenile Research. He is greatly indebted to Professor Samuel Renshaw of Ohio State University for his advice and criticism throughout the experimental period.

> is merely a restatement of the fact that they do appear..... If Weiss and his co-workers found themselves unable to isolate the inherited factors in even so simple a sensori-motor mechanism as sucking, the student of psychology may as well admit frankly that he is unable to isolate the inherited factors in any complex human mechanism..... At any rate, as long as contradictory reports continue to stream from the printing presses, the cautious will probably find it judicious to postpone whole-hearted acceptance of the testimony of the recent enthusiasts who appear to substitute 'maturation' for 'instinct.'" (10, pp. 57-58.)

PROBLEM

The problem of the present study, the influence of the age and sex of the learner on the learning of the operation of a pursuitmeter, has its logical setting in the following hypotheses: (1) The older an animal is, in general, the more habits it will have formed and the more firmly these will be fixed. What then of transfer and retroaction, enhancement, and inhibition of the new act being learned by the older animal? Since Jenkins and Dallenbach (4) have shown the inhibitory effect of activity on retention, does it follow that the larger the range of possible activities the greater the inhibitory effect they may have on the efficient adjustment of the organism; or are there other factors besides this inhibitory influence which may enable the organism with the largest repertory of behavior patterns more adequately to adapt itself to its environment? (2) The young animal has few habits; hence there will be little interference and likewise little reinforcement from what reaction systems are already present. But is it likely that learning a new skillful act may be to a considerable extent a matter of the use of already existing activities and that the absence of these may prove to be a hindrance to the learning of a novice; or will the sparsity of behavior patterns and the likelihood of little or no inhibitory influences promote more rapid acquisition of the elements required for learning?

It is likely that a study which can show differences in learning based on age should throw some light on these complicated problems.

APPARATUS

The pursuitmeter as a learning device has been in use since Seashore's (6) psychergograph which was described in 1902. The apparatus used in this experiment is known as the Renshaw-Weiss pursuitmeter, an instrument perfected in the psychology laboratory at Ohio State University. It consists essentially of a movable lever arm to which is attached dielectric material in which a copper electrode is embedded. This is called the bead. There is a solid rubber stylus with a hammer-like tip in which is another copper electrode. The task consists of keeping the stylus head on the bead so that the machine will run continuously. If the stylus is not held flat and steady with the arm held in a horizontal position, the contact between the copper electrodes will be broken, the broken contact is recorded by an electromagnetic counter, and the instrument stops. The number of broken contacts per cycle is the datum from which the learning curves are constructed.

The machine is run by a constant-speed motor which is stepped down by a gear-reducer. The contact between the electrodes mentioned above completes the circuit to the motor and produces the movement. By means of a number of gears and levers, the bead describes a constant pattern during the 63 revolutions which compose a cycle of the instrument. The pursuitmeter is so designed that after this interval of movement is completed it automatically stops and will not start until another switch is set by the experimenter. This interval of movement, the cycle, takes about four minutes during a perfect performance. It may require longer time during a poor performance.

Psychologically, the pursuitmeter differs from most devices used for studies of age differences in learning. It demands continuous reaction rather than intermittent reaction. Its manipulation makes no great demand for delicacy of movement of the finer or smaller accessory muscles of the arm and fingers. It requires very little expenditure of energy, but a moving picture analysis of the subjects indicated the importance of a high degree of muscular coördination in the acquisition of the skill necessary for the mastery of the instrument. Probably no

other similar device can present a task of approximately equal difficulty that can be used with so wide a range of ages without the introduction of considerable error in the results incidental to this factor of difficulty.

In pursuitmeter learning, height, weight, strength of arms and hands, size or length of arms, acuity of vision, etc., are not important factors. While the test is a continuous one, it is fairly uniform in difficulty from minute to minute, and at the same time is so varied as to require constant watching on the part of the subjects, at least in the early stages. Quickness of response and accuracy of localization are essential elements in the learning of the manipulatory responses involved in this skill. The minimum task is the same for every subject, though it will be seen from the results that the younger children probably do much more work in accomplishing the same task.

SUBJECTS

The seventy-eight subjects, forty-five boys and thirty-three girls, were residents at the Ohio Bureau of Juvenile Research at Columbus, Ohio. These children varied in chronological age from seven to seventeen years. They varied in Stanford-Binet I.Q.'s from 64 to 124.

The method of selection of the subjects from the population of the Bureau was rather carefully adhered to. The experimenter obtained from their respective psychoclinicians the names of the children who were likely to be residents for the length of time that they would be used. Following this, the medical report of each subject was investigated for any neuromuscular deficiency which would render their motor adaptability low. These children lived under more controlled conditions than they would have had at home in that their diet, hours of work, reading, study, play, and sleep were under expert supervision. These are ideal conditions under which to conduct an extended investigation.

METHOD

The subjects were brought over to the experimental room which was a large well-lighted basement room, and were given two cycles of practice a day until 36 cycles were completed. There was an interval of at least ten minutes between the successive cycles, since by experimental investigation (9) a five to nine minute period had been previously determined to be the best rest period for adults.

RESULTS

Age Differences

The results[1] considered are of two types: (1) curves and (2) point-progress data.

Figures 1 and 2 show the smoothed curves of boys and girls arranged on the basis of chronological ages from seven to seventeen years. The curves of all subjects show a rapid initial drop followed by a gradual slowing down; i.e., the curves are negatively accelerated, but the youngest groups (seven, eight, and nine years) show practically no progress.

The greatest amount of improvement in the progress of the subjects came within the first third of the practice series, i.e., within the first 12 cycles. This may mean that the initial practices involve a rather vigorous differentiation of the specific activities from the large mass of behavior patterns, and then, as practice continues, that the highly specific activities are reorganized and consolidated. Some evidence of this can be seen in the motion picture made of a subject learning to run the pursuitmeter in that the movements are individuated from the trunk, shoulder, and arm toward the finger.

An analysis of the data indicates that, in general, both the limit of improvement and the rate of improvement from practice increase directly with age. The learning curves of the boys seem to group themselves into three groups: the eight- and nine-year-old boys at one level; the ten-, eleven-, and

1. The results in tabular form are to be found in the writer's dissertation deposited in the library at Ohio State University.

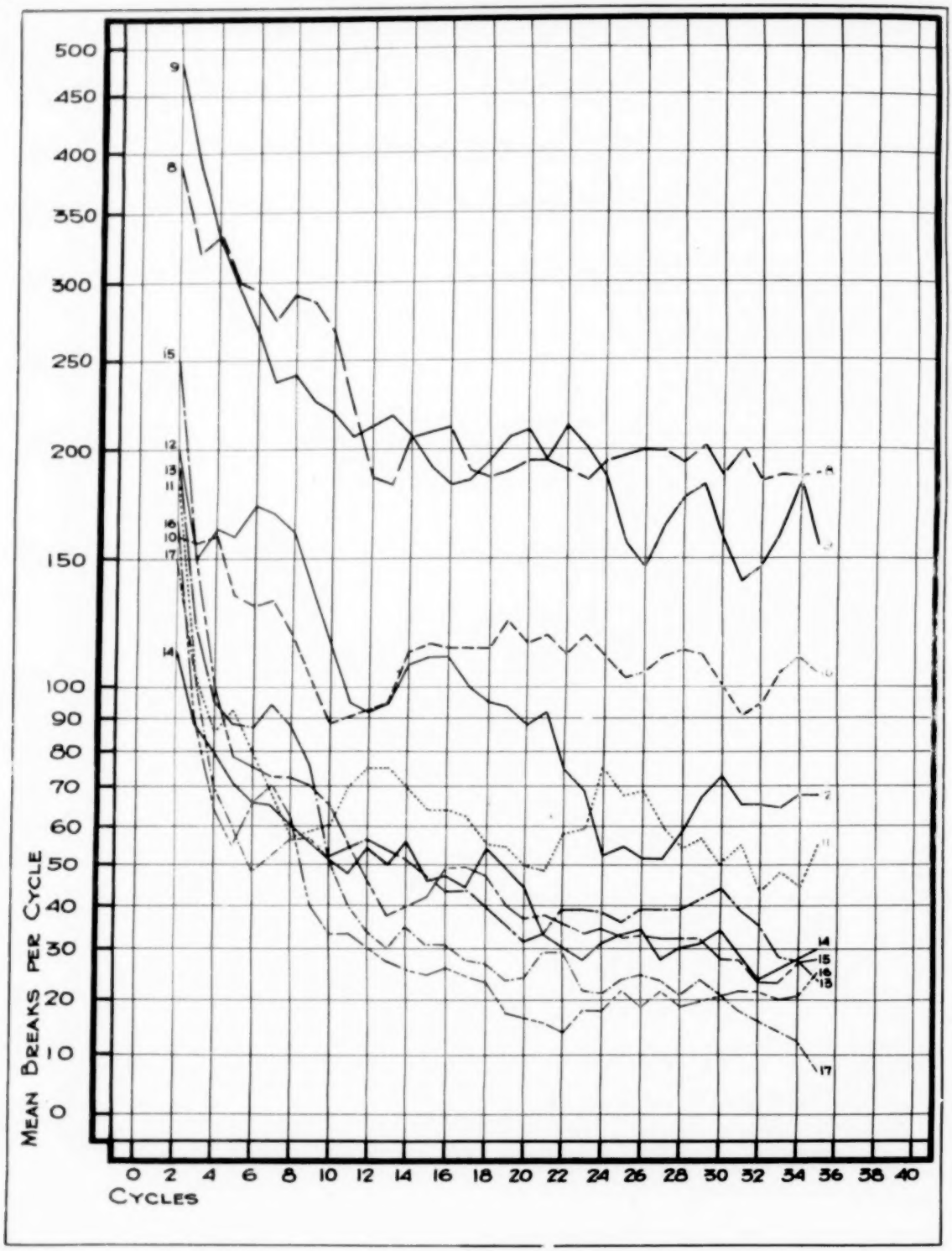

Figure 1

Mean Breaks Per Cycle for Boys, Chronological Age Groups Eight to Seventeen Years.

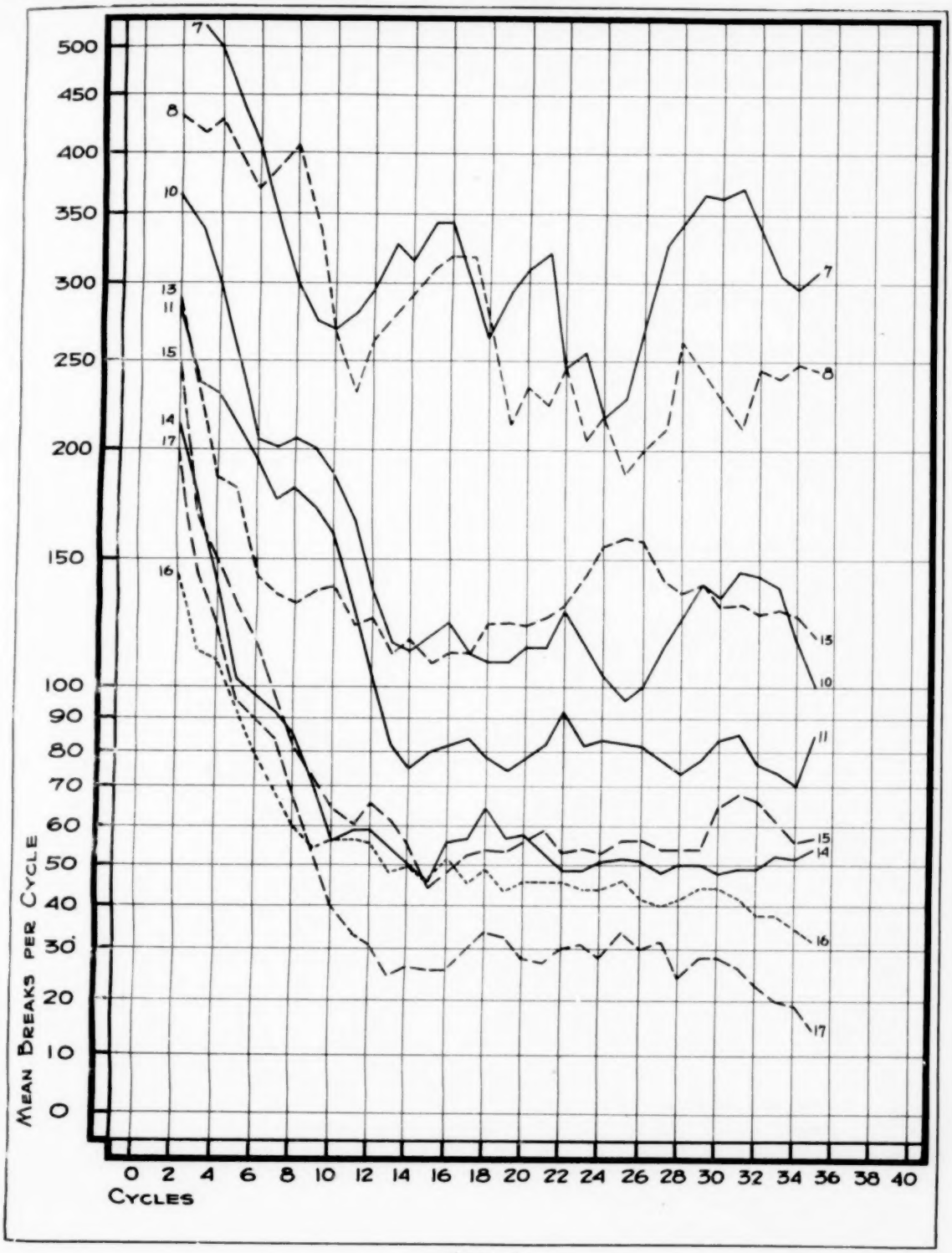

Figure 2

Mean Breaks Per Cycle for Girls, Chronological Age Groups Seven to Seventeen Years.

twelve-year-old boys in a middle group; and the remaining ages through seventeen in a third group. Each group's rate and limit of improvement is superior to that of the immediately preceding group. A significant drop occurs in the curves of the eleven- and twelve-year-old boys, which may be associated with the fact of their approaching the age of puberty.

Inspection of the curves representing the data of the girls (Figure 2) indicates a like grouping. The first group is composed of the seven- and eight-year-old girls; the second group is made up of the ten-, eleven-, and thirteen-year-old girls, and the last consists of the fourteen- through seventeen-year-old girls. There were no cases at ages nine and twelve.

The sixteen- and seventeen-year-old groups, both boys and girls, had better results in running the pursuitmeter than did the eighty-six college students who were used in experiments at Ohio State University.

The progress made by the eight- and nine-year-old boys is relatively so small and the improvement covers such a short range within the practice series that it seems somewhat forced to apply the term "learning" to these ages. Their procedure consisted of little more than repeated replacing of the stylus on the bead, starting the machine, letting the stylus slip off, putting it back on, etc. When one considers that there are only 63 revolutions to a cycle and the lowest number of lost contacts for the eight-year-old boys was 173 and for the nine-year-old group 140, then the mean number of lost contacts per revolution would be 3 and 2 respectively. It would take approximately four minutes to complete a cycle if the apparatus were run correctly. This means that the eight-year-old group was making 43 lost contacts per minute or nearly one every second and that the nine-year group was making 35 per minute or approximately one every two seconds, as compared with the two and one lost contacts per minute of the sixteen- and seventeen-year-old boys. This can hardly be called efficient running of the instrument. The little improvement that did take place came within the first third of the practice series, whereas in the older groups improvement continued almost to the end of the practice series of 36 cycles.

In addition to the curves, the data may be studied by means of the point-progress method which gives the point at which one group of subjects reaches the level of another group. A given point may be reached before, at the same time, or after the time at which the comparison group reaches that point, thus giving a comparison of the relative rates of improvement of two or more groups. This point-progress method of interpreting the data indicates that the boys, when one compares the various age groups arranged in sequential order at nine, ten, eleven, thirteen, fourteen, and sixteen, are superior to the immediately preceding ages. Using the same comparison for the girls, we find that ages eight, ten, eleven, and thirteen to seventeen inclusive are superior to

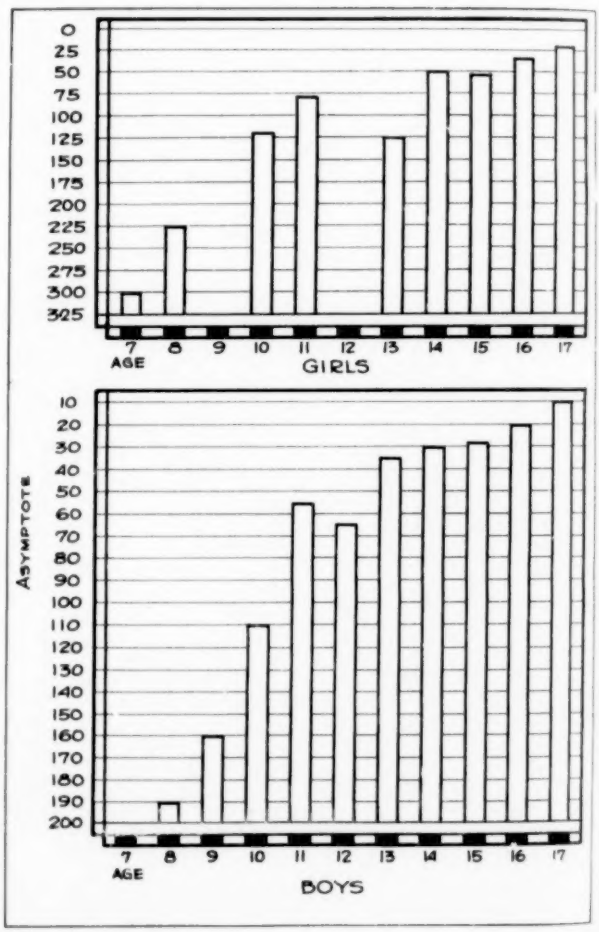

Figure 3. Asymptotes in Learning Curves, Boys and Girls, Chronological Ages Seven to Seventeen.

the immediately preceding ages. Ages ten and thirteen for the girls had to be compared with eight and eleven respectively, since there were no cases at nine and twelve.

If the asymptotes of the various learning curves are determined by inspection, it is found that each succeeding age reaches its asymptote at a later period in the learning series. Figure 3 gives a graphical representation of the data.

Sex Differences

As we ascend the chronological age scale, the learning curves indicate that the large differences between the sexes in the lower ages become smaller in the upper age levels. The boys from eight to seventeen are better than the girls. These differences become progressively smaller for the older subjects.

The point-progress method indicates the superiority of the boys when compared chronologically with the girls at all ages.

CONCLUSIONS

The influence of age and sex on learning to run the pursuitmeter, as obtained from an analysis of the experimental data, can be summarized briefly:

1. The rates and limits of improvement from practice increase with an increase in chronological age. There is overlapping between some of the ages, but the general trend of increasing efficiency with increasing age seems to hold throughout the range of ages studied.

2. The subjects seemed to fall into age groups, separated from each other by differing intervals.

3. The period of greatest improvement in this skill appears during, or near the beginning of, the adolescent period. This period of great improvement, together with the classification of the subjects into the previously mentioned groupings, fits in well with recent anatomical and neurological interpretations as to the periods of growth in the development of the human brain. This would give a reasonable anatomical basis for the age differences.

4. An increase in age does not bring a conflict between the various manipulatory responses involved in the acquisition of this skill. As the ages increased, the superiority of the subjects increased. This lack of inhibition, together with the growth of brain structure, implies that skills of this type should be taught at certain specified ages and that individuals may waste much time in attempting the mastery of certain skills too early in life. It would imply that the acquisition of this type of skill is closely related to the increased repertory of behavior found in the older subjects. This indicates the importance of bringing children into contact with as many situations that will promote learning as possible so that the child will build up a large group of responses which will enable him to adapt himself to future situations. It does not imply a maturation factor, at least separate from learning.

5. The upper ages (sixteen and seventeen) did better than the eighty-six college students. This could mean that increased age brings a decrease in the facility with which an individual can adjust himself to those acts of skill which require a high degree of manipulatory adroitness.

6. Boys learned to manipulate the machine more readily than did girls.

7. The greatest progress was usually made within the first third (the first 12 cycles) of the learning series.

8. The order of the individuation of the movements through practice proceeded from the trunk, shoulder, and arm toward the finger.

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A STUDY OF CHILDREN'S FEARS

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The present report deals with some of the preliminary results in a study of children's fears. The investigation as a whole includes the following approaches: (1) daily records kept at home by parents of preschool children for periods of twenty-one days at a time; (2) interviews with parents concerning the fears of their children; (3) records of fear episodes observed by an additional group of teachers, parents, nurses, and others; (4) private interviews with children aged five to twelve years; (5) reports by adults of fears remembered from childhood;[1] and (6) observations of children's responses in experimental situations.[2]

DAILY HOME RECORDS OF CHILDREN'S FEARS

The parents of fifty-four children, aged six months to four years, have coöperated in providing written reports of fears observed during a period of twenty-one days. Five of the children were observed for this length of time on two different occasions separated by an interval of almost a year.

The parents were provided with forms similar to the abbreviated copy reproduced on page 110 and a letter of instructions with regard to the procedure. The parents were asked not only to use a separate blank in describing each fear that occurred, but also to indicate periods during which no fear was displayed. They were asked to keep a record of the intervals during the day when the child was under observation. A period of observation was defined as any time during the day when a parent or an adult in the household was in a position to know what the child was doing and to notice and record fear reactions if any occurred even though the observer was not exclusively occupied in watching the child.

The majority of the children lived in New York City; a few lived in the suburbs, and a few in small towns and rural communities. Judged by their educational background and their socio-economic status, the children's parents were above average in intelligence.

The fears reported by the parents were classified according to the categories described in the following tabulation:

Situation Confronting Child When Fear Occurred	Children Showing Fear	Total Times Fear Was Observed
Strange objects, persons, situations	33*	102
Strange persons: new elevator boy, stranger stopping to help child on street, uncle or other relative never seen before, new maid, unfamiliar workmen in the home, etc.	19	47
Strange objects: ironing board, doll with moving eyes, elk's head, toy bear, new ball, pictures, shadow, etc.	18	27
Unfamiliar changes or variations connected with familiar objects: child friend wearing a bandage, mother with cold cream on face, grandmother without glasses, mother with hair hanging down and dripping, blanket rumpled, etc.	10	14
Unfamiliar surroundings: first visit to department store, strange house	5	9
Unfamiliar persons and strange place combined	4	5

*Separate totals are given for subheadings under the general category "strange persons, objects, and situations." Since a child who displayed fears under more than one of the subheadings was tallied only once when a count was made for the category as a whole, the figure representing this count is smaller than the sum of the children represented under each subheading.

1. Not reviewed in the present paper.
2. An independent study by Frances B. Holmes.

PARENTS' RECORD OF FEARS

(Abbreviated Form)

Name of child _____ Time observation began _____

Name of observer _____ Time observation ended _____

Date _____ When recorded:
At time of observation? _____

How long afterward? _____

If no fear occurs, simply indicate with a check mark here _____. Use a new blank to describe each fear and a new blank for each period of observation, even when no fear occurred. Use back of sheet if more space is needed.

If any of these or other conditions occurred during the day that were outside of the child's regular routine, please underline or specify: child taken visiting, shopping, riding in automobile, to doctor or dentist, etc.; child came in contact with strange children, adults, or animals inside or outside of home; child missed usual daytime nap, had less than usual amount of sleep during preceding night, had meals at irregular hours, etc.

Underline or specify as to physical condition: normal, lack of appetite, slight cold, heavy cold, fever, digestive upset, other unusual physical conditions (describe).

Situation in which child gave signs of being afraid (place, time, what child was doing at time, persons present, apparent cause of fear, etc.).

Behavior of child (words spoken, cries, other vocalization; jumping, starting, withdrawing, running away, and other physical activity; etc.).

Following behavior: Does child show any continued avoidance, uneasiness, or other unaccustomed behavior toward anything connected with situation in which fear arose?

Has this fear occurred before? If so, how frequently? (Describe)

Situation Confronting Child When Fear Occurred	Children Showing Fear	Total Times Fear Was Observed
Noises and objects from which noises have come: bursting paper bag, steam roller, distant sound of band (not seen by child), rattling window, automobile horn, etc.	31	64
Animals: dogs, cats, rabbits, pigeons, horses, cows, etc.	28	50
Pain and objects or persons associated with pain: doctor's office, doctor, medical examiner, nurse, threat of spanking, child or adult who had previously hit the child, radiator	21	40
Displacement, falling or possible danger of falling: being in a high place, walking over grating or covering of a manhole, being blown forward by the wind, riding in car with open door, suddenly tilted in dentist's chair, slipping on toilet seat, standing before an open gate on ferryboat, standing on shaky platform, etc.	15	23
Sudden or unexpected movement: towel moving in the bath water, sudden collapse of balloon, leaf moving in the wind, curtains blowing in the wind, ball rolling over a wrinkle in the rug, etc.	7	12

Situation Confronting Child When Fear Occurred	Children Showing Fear	Total Times Fear Was Observed
Darkness: dark closet, hallway, room	6	8
Being alone or shut in: alone in room, going to a room unaccompanied	4	8
Fear induced during play: "scary games," bogey games, hide-and-go-seek	4	4
Fears apparently arising from a dream as indicated by child's outcries on awakening: "The bad witch," "an eagle was picking me up," "I was riding a bicycle and fell."	3	4
Fear of being abandoned by parent: father walks toward door with a stranger, left by mother in a store	2	3
Fear of fire	1	1

The mean number of fears per child for the twenty-one days reported at the respective age levels of one, two, three, and four years was 5.8, 6.7, 3.8, and 4.2 respectively. These figures indicate that children aged three and four displayed fewer fears than younger children, but there was so much variability between children within each age group that no final conclusion can be drawn on the basis of these means.

As shown in the preceding tabulation, the greatest number of fears occurred in response to strange objects, persons, and situations. Within this category fear of strange persons was the most frequent.

In classifying the fears reported by the parents, no fear was tallied under the heading of "strange objects, persons, and situations" if the report contained a record of any feature which overlapped with other categories. For example, if a child was reported as being afraid the first time he saw and heard a music box, this fear was tallied under the heading of "noises." Likewise, if a record indicated that a child showed fear in the presence of an object which moved suddenly, the fear would be tallied only under the heading of "sudden and unexpected movements" even though the object itself might, in addition, represent something the child had never seen before. Moreover, no fear was classed as a response to strange objects, persons, or situations if the record gave any clue to events which had been associated with the object at a previous time, such as pain, loud noises, loss of support, and the like. It is possible, however, that in many instances the element of strangeness was the apparent rather than the real cause of fear. In many cases, no doubt, fear of an object occurred not because the object was new and found the child without an adequate adjustment, but because it represented something which he had previously learned to fear under conditions unnoticed by the parents.

Even though the above reservations are made, it appears that a child of preschool age often becomes afraid when confronted with objects, persons, and situations which are unfamiliar to him and for which he apparently has not previously acquired an adequate response.

The tabulation given above shows that the second largest group of fears consisted of fears of noises and objects from which noises had come. Other relatively frequent fears, in the order of their frequency, are fears of animals, of conditions previously associated with pain, and of displacement and falling. Other categories which occur relatively less frequently include fears of sudden or unexpected movements, darkness, being alone or abandoned, "scary games", fears arising from dreams, and fear of fire.

Table I on page 112 shows the distribution of the fears according to age, giving the percentage of children at each yearly age level who displayed one or more of the fears described in the preceding tabulation. In keeping with the decline in the mean number of fears with age, the percentages at ages three and four are in most instances smaller than the corresponding percentages at ages one and two. Some differences appear apart from this tendency. There is a decline with age in the relative frequency of fears of strange events, fears of noises, high places, and displacement. On the other hand, fear of animals was observed relatively oftener in children aged three or more than in children below the age of three. However, the

TABLE I

RELATIVE FREQUENCY OF FEARS AND PERCENTAGE OF FEARS IN DIFFERENT SITUATIONS AT DIFFERENT AGE LEVELS AS REPORTED BY PARENTS FOR A PERIOD OF TWENTY-ONE DAYS

Situation	Age, Years				
	Birth to 1	2	3	4	All Ages
	Children				
	10	25	19	5	59*
	Per cent				
Strange objects, persons and situations	50	80	37	20	56
Noises and objects associated with noise	60	64	42	20	53
Animals	30	52	47	60	47
Pain and events previously associated with pain	40	48	21	20	36
High places, falling and displacement	50	20	26	0	25
Sudden and unexpected movements	10	20	5	20	14
Being alone, abandoned, shut in	0	16	5	20	10
Darkness	0	12	16	0	10
"Scary" games	0	12	5	0	7
Fears apparently arising from dreams	0	8	0	20	5
Fire	0	4	0	0	2

*Includes five children who were observed during two twenty-one day periods separated by an interval of one year. The actual number of children, not counting these recurring observations, was fifty-four.

difference is small. Fear of darkness was relatively more frequent among the three-year-old subjects than among two-year-olds, although the difference here again is small.

FEAR EPISODES OBSERVED BY AN ADDITIONAL GROUP OF PARENTS, TEACHERS, AND NURSES

In an effort to obtain a more representative although less systematic survey of children's fears, written reports were obtained from a number of nurses, nursery school teachers, and parents most of whom were former or contemporary students at the Child Development Institute, Teachers College, Columbia University. Blanks similar to the abbreviated form reproduced on page 113 were sent to these individuals with the request that they describe instances of fear which they had observed. They were not asked to spend any time in formal observation of children, but were requested simply to describe the most prominent fear incidents which had come to their attention.

It can readily be seen that this method of obtaining data is quite unsystematic, and that reports obtained are influenced largely by chance factors in the case of each individual and to some extent also by preconceived views concerning children's fears. It was precisely this element of personal judgment which was desired, however. The aim was to obtain, as far as possible, a report of aspects of fear behavior which had impressed each individual most forcefully in his own personal experience with children.

At the present time, forty-eight individuals have each reported two or more fears in this division of the study. The reports have come from several states and represent observations of urban and rural children, children in private homes, in hospitals, day nurseries, and nursery schools. The children whose fears were reported ranged from two months to six years in age with a median age of three years.

FEAR RECORD FOR PARENTS, TEACHERS, AND NURSES

(Abbrev ated Form)

Child's (approximate or exact) age when fear occurred _____ Sex _____

Name of observer _____

How long ago did the fear situation occur?

Situation which apparently caused fear.

Behavior of the child in the fear situation (crying, withdrawing, etc.).

Comments with regard to such factors as apparent origin of fear, frequency of occurrence as compared with other fears, effect on later behavior, relationship to other characteristics of the child, etc.

The following tabulation shows the distribution of the fears thus reported when they were classified under the general headings described in the tabulation on page 109. The total number of fears is 164.

Situation Which Apparently Caused Fear	Total Fears Described
Strange objects, persons, and situations	35
Pain and conditions previously associated with pain (other than falling)	30
Animals	29
Noise and objects from which noises have come	26
Displacement, high places, apparent danger of falling or losing support	20
Being alone, abandoned, shut in	11
Darkness	4
Fear apparently concerning the safety of others (e.g., another child diving into water, etc.)	3
Fears arising from dreams	2
Fire	2
"Scary games"	1
Sudden and unexpected movement	1

It can be seen that the conditions under which the reports of the fears represented in the above tabulation were obtained differed considerably from the procedure used in obtaining the reports represented in the tabulation on page 109. In view of this it is interesting to note the general similarity of the two tabulations. In both, the greatest number of fears occur in the category "strange objects, persons, and situations." Likewise, many fears occur in both tabulations under the headings of noise, pain, animals, and displacement, although there are minor differences with respect to the relative frequency of each of these categories. The most pronounced differences occur with respect to fears induced by sudden and unexpected movements. Under this heading occurs only one fear in the tabulation above as compared with twelve in the tabulation on page 109. These figures represent, respectively, .6 and 3.8 per cent of the total number of fears.

EXPERIMENTAL STUDY OF FEAR

In an experimental approach to the study of fear, which is being made in a separate study by one of the authors, the aim has been to observe the behavior of children when they are confronted with situations which sometimes give rise to fear in daily life. The experimental situations are not designed to frighten the child, but rather to test his willingness to participate in a variety of activities.

The children who have been studied range in age from twenty-one to seventy-one months. The situations used in the study are as follows:

High place: A board, 12 inches wide and 8 feet long, is used. The board can be raised to altitudes ranging from two to six feet. Toys in which the child has previously shown an interest are placed at the far end and the child is asked whether he cares to walk the length of the board to get them.

If he assents, he is placed upon the board and watched as he walks across.

Dark room: The experimenter, while playing with the child in a gymnasium unfamiliar to the child, seemingly inadvertently throws the ball into a dark, long and narrow passageway adjoining one corner of the room. The child is asked to go and look for the ball and to bring it back.

Being left alone: While the child is occupied with some toys which have just been placed before him, the experimenter slips out of the room and closes the door. The child's reactions when he discovers that he is alone are noted by an observer who is hidden behind a screen in an alcove of the room.

Loud sound: While the child and the experimenter are occupied with a number of toys, an assistant, hidden behind a screen in an alcove of the room, produces a loud sound by striking an iron pipe with a hammer. When the child looks up, the experimenter asks the child to go into the alcove to find out what had caused the sound.

Insecure underfooting: The child is asked to walk across a bridge consisting of two boards laid end to end and raised about three inches above the floor. The first board is securely fastened but the second, which is supported only by a block in the center, tilts when the child steps upon it. The child is observed to find whether he continues to walk the length of the board in spite of the teetering and the insecurity of the board.

Strange person: While the child is temporarily withdrawn from the room, an assistant dressed in a large hat, a long flowing dress, and a veil seats herself near the door. When the child returns with the experimenter, his reactions are observed (1) when he notices the stranger and (2) when asked to get a toy placed near the stranger's chair.

Snake: A lively snake, about two and one-half feet long, is shown to the child. The child is asked to reach for a toy placed in the crate in which the snake is imprisoned. Children who show no fear are then asked to lay hold of the snake and lift it out of the crate.

Horned toad: The child is asked to reach for a toy that is lying in a box which contains a live horned toad about five inches in length.

Small dog: The child is asked to pat a small mongrel dog (mostly terrier) which is brought into the room by the experimenter.

Large dog: The child is asked to pat a large collie which is brought into the room by the experimenter.

In recording the child's behavior in each of these situations, the experimenter and her assistant used a check list containing a large variety of items of behavior. They also made a record of the child's language and of activities which were not included in the check list.[1] At the conclusion of the observation the child's behavior could be classified roughly under four general headings as follows: (1) child shows no signs of fear, complies at once, unhesitatingly; (2) hesitates and demurs momentarily, and then in response to a repetition of the experimenter's request proceeds to carry out directions without help or accompaniment; (3) refuses to proceed without accompaniment or help even though urged and reassured by the experimenter; and (4) utterly refuses to proceed even when repeatedly urged and when the experimenter offers to accompany him, hold his hand, and help him.

To measure the reliability of the records of the child's behavior, independent observations were made by two persons. In a total of 216 situations there was only one instance of disagreement with respect to behavior recorded by one or the other observer under categories 3 and 4 (the categories on which Table 2 is based). The two observers disagreed as to whether behavior should be classed under category 1 or 2 in twenty instances. The total agreement between the independent observers was 90 per cent.

Table II on the following page shows the percentage of children at each age level who displayed a fear response in each of these situations. By a "fear response" is

1. This check list, containing descriptions of various reactions such as "grasps hold of experimenter", "turns away", "makes no movement", etc., was prepared on the basis of preliminary observations of many children in each fear situation.

TABLE II

RELATIVE EFFECTIVENESS OF VARIOUS EXPERIMENTAL SITUATIONS AS SHOWN BY PER CENT OF CHILDREN EXHIBITING FEAR AT EACH AGE LEVEL

Situation	Months									
	21 to 35		36 to 47		48 to 59		60 to 71		21 to 59	
	Children	Per Cent	Children	Per Cent	Children	Per Cent	Children	Per Cent	Children	Per Cent
Snake	16	63	15	73	3	33			34	65
Small, active dog	16	75	20	45	3	33			39	56
Large, quiet dog	15	73	15	13	3	67			33	45
Dark hallway	22	41	30	47	8	38	6	0	60	43
High place	22	32	30	40	8	13	6	0	60	33
Strange person	22	36	30	17	8	0	6	0	60	22
Noise	22	18	30	17	8	0	6	0	60	15
Insecure platform	22	26	30	7	8	0	6	0	60	13
Horned toad	16	6	16	13	3	33			35	11
Per Cent of Situations in Which Fear Occurred		35.5		28		17.5		0		

meant any reaction conforming to categories 3 and 4 described above.

As indicated in Table II, the group as a whole showed more fear in response to the snake than to other stimuli. Next in order of effectiveness were the dogs, the dark hallway, the high place, and the strange person. The particular noise which was used and the insecure footing produced relatively little fear; the toad was least effective of all.

Table II shows a definite decline with age in the frequency of signs of fear in these situations. The decline with age in the frequency of fear is not, however, equally noticeable in all situations, as can be seen when the two- and the three-year-old children are compared. Three-year-old chilfren showed relatively less fear than two-year-old children in response to the dogs, the strange person, and the insecure footing; on the other hand, they showed relatively more fear in response to the snake, the toad, and the high place.

Relation Between Fears in Experimental Situations and Teachers' Reports

As an added feature in this study, the investigator obtained nursery school teacher's ratings with which to compare the results in the experimental situations. At the end of the school year, each nursery school teacher was asked to rate each child on the basis of her estimate of his tendency to show signs of fear as compared with other children. Each child was given a score on a scale ranging from 0 (never shows signs of being afraid) to 20 (extremely susceptible to fear, very frequently shows signs of being afraid). Each child was rated by four teachers, each of whom had observed him during the school year. In preparing these ratings the teachers worked independently of one another; they had no knowledge of the children's behavior in the experimental situations.

Among the children thus rated, there were thirty who had been exposed to all of the ten fear situations described above. Each child's composite rating was determined by averaging the scores assigned to him by the four nursery school teachers. Each child was also scored on his behavior in the experimental situations. The "fear score" in the experimental situations was determined as follows. The child's reactions in the experiments could be classed under the four general headings previously described: (1) no sign of fear whatsoever, (2) complies with experimenter's request only after some hesitation, (3) refuses to approach the situations unless accompanied and aided by

experimenter, and (4) utterly refuses to have anything to do with the situation under any circumstance. These reactions were given the respective values of 1, 2, 3, and 4. Accordingly, if a child emphatically shied away from all of the ten experimental situations, his "fear score" would be 40. If he met each situation unhesitatingly without the slightest sign of fear, his score would be 10.[1]

The correlation between the children's scores in the experimental situations and their scores when rated by their teachers was .42. Although this figure is not high, it is higher than the coefficients often found in studies of children when correlations are made between behavior in experimental situations and teachers' ratings.

INTERVIEWS WITH PARENTS

As a supplementary project, interviews were obtained with the mothers of eighteen children who had not only been rated by nursery school teachers but had also served as subjects in ten experimental situations. One feature of the interview consisted of a check list of fears, including a complete representation of all the fears which had been reported by parents who had observed their children for a period of twenty-one days as well as those reported by other parents, teachers, and nurses. Each item was named in turn and the mother was asked whether her child had ever displayed a fear of this character. In addition, the parent was asked to name any other fears, not included on the list, which she had observed. At the conclusion of the interviews, a tally was made of the number of fears reported by the mothers in the case of each child.

The correlation between the number of fears reported by mothers and the children's "fear scores" in the experimental situations was .44. The correlation between the interview figures and the teachers' ratings was .17.

CHILDREN'S OWN REPORTS CONCERNING THEIR FEARS

This aspect of the investigation has been reported in more detail in a separate study.[2] A brief review of the results will be of interest in the present connection, however.

Three hundred ninety-eight children, including forty-nine or fifty at each age level in the ages from five to twelve years inclusive, were asked in private interviews to tell about their fears. The fears reported by the children were classified under general headings.

A large proportion of the dangers named by the children in describing their fears were more imaginary than real. Fears in the category of the supernatural, of mystery, dead people and corpses were reported as foremost fears by over a fifth of the children. Fear of the dark, of being alone, and fear of animals (consisting almost exclusively of lions, tigers, wolves, and other remote creatures) likewise were mentioned by a large proportion of the children. With the exception of the fear of animals, there was no decline with age in the frequency of fears of these improbable dangers.

The children's replies indicated that a majority of their fears arose through vicarious stimulation. Most of the fears which they described were quite distinct from actual dangers which occur in daily life. The children frequently mentioned the movies, radio stories, terrifying tales told by others, and deliberate attempts by adults to frighten as factors in promoting their fears.

The fanciful nature of the children's fears is emphasized by the results of other aspects of the investigation. Each child who told about his fears was also asked in another part of the interview to describe the "worst thing that had ever happened" in his life. Later in the interview the children were also asked to describe their

1. A score of 10, it can be seen, actually is equivalent to zero since it means no fear. Logically the scores should range from 0 to 30, but this is immaterial since it is the relative rather than the absolute scores that are important in this connection.
2. Arthur T. Jersild, F. V. Markey, and L. C. Jersild, Children's Dreams, Wishes, Fears, Pleasant and Unpleasant Memories, Likes, Dislikes, Daydreams, and Imaginary Companions, Child Development Monograph. New York: Teachers College, Columbia University, 1933.

TABLE III

EVENTS DESCRIBED BY 398 CHILDREN, FIVE TO TWELVE YEARS OF AGE, A FEAR SITUATION, PER CENT DESCRIBING EVENT AS FIRST-NAMED FEAR, PER CENT REPORTING EVENT IN UNPLEASANT DREAMS, AND PER CENT REPORTING EVENT IN DESCRIBING "WORST HAPPENINGS"

Event Described by Child	Per Cent Describing Event as First-Named Fear	Per Cent Reporting Event in Unpleasant Dreams	Per Cent Reporting Event in Describing "Worst Happenings"
Bodily injury, illness, operations, accidents, falling, etc.*	9.6	11.7	72.7
Animals	17.8	4.7	1.8
Contacts with and activities of criminals and bad characters	7.3	14.2	1.3
Being alone, in strange place, lost, strange sights and sounds	14.1	11.6	2.3
Death, loss, removal of relatives	1.8	5.0	5.0
Contacts with or activities of ghosts, bogeys, supernatural beings, corpses, skeleton	21.1	6.9	0.0
Remaining categories (not itemized)	28.3	45.9	16.9

*Not including attacks by animals or criminal characters.

dreams. Table III shows the relative frequency of various events that occur in fears, dreams, and worst happenings as described by the children themselves.

In Table III it appears that, although almost 73 per cent of the children thought of some form of bodily injury, illness, or physical accident as the "worst happening" that ever had befallen them, less than 10 per cent named events of this kind as a prominent source of fear. On the other hand, although less than 2 per cent told of actual unpleasant encounters with animals, almost 18 per cent named an animal as one of their foremost fears. In like manner, fear of criminals and "bad" characters and fear of supernatural events occurred decidedly more frequently than would be justified by actual happenings in the children's past experience.

SUMMARY AND DISCUSSION

Strange and unfamiliar events, objects, persons, and places outnumbered other situations as the apparent cause of overt signs of fear in the behavior of preschool children. Situations which also frequently gave rise to fear were noises and objects from which noises proceed; animals; pain and conditions previously associated with pain; and high places, falling, and displacement. Other situations which sometimes gave rise to fear included being alone and darkness.

According to the results of records kept by parents in their homes, the fear of strange or unfamiliar objects, persons, and situations reaches its peak at the age of two years. This result undoubtedly is influenced largely by developmental factors. At the age of two the normal child is able

to walk and is thus enabled to explore his environment and to meet many situations which were not so accessible to him at an earlier time. Furthermore, at this age he is better able than at an earlier time to discriminate between events and objects which he meets, and to notice differences between the familiar and the unfamiliar.

There is a tendency toward a decline in fear of concrete physical objects and events after the second year. This suggests that, through increased experience with his environment, the child becomes accustomed to many events and comes to regard as commonplace many situations for which he originally had no adequate response. On the other hand, as the child grows older he becomes conditioned to many stimuli which previously had no meaning to him and he becomes capable of entertaining fears of remote and improbable dangers.

To answer the question as to what are the original, unlearned causes of fear would require a more thorough genetic study than has been undertaken in the present investigation. The results hitherto obtained in the present study suggest, however, that among the conditions in which the child often shows fear, apparently as the result of being unprepared to cope with his environment, are loud sounds, displacement and loss of support, sudden and unexpected happenings, unfamiliar sensory events for which he has acquired no adequate response, and (as the result of at least one previous experience) events previously associated with any sort of physical pain.

LAUGHING AND CRYING OF PRESCHOOL CHILDREN

by
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The purpose of this study was: (1) to develop a technique for the objective recording of laughing and crying of preschool children that would be reliable, would measure the constancy of behavior, and would differentiate between individuals; and (2) to gather a body of data which might be analyzed from the viewpoint of studying the social and emotional behavior of preschool children.

SUBJECTS AND SOURCES OF DATA

The subjects chosen for study were twenty-nine children who attended the nursery schools of the Child Development Institute, Teachers College, Columbia University. They included seventeen children from the younger nursery school group ranging in age from eighteen to thirty-four months and twelve children from the older group ranging in age from thirty-four to forty-eight months. A total of twenty-four five minute records of observation was made on each of twenty-nine children during the free play period when their activity was relatively free from adult interference. In the nursery school this period extended from nine to eleven o'clock in the morning. In addition to these records, twenty-four five minute observations were made on each of seventeen children in the younger group during routines such as the eating, toilet, and nap situations when the activity of the children was directed by adults. A total of 1,104 five minute records comprised the data of the study.

In order to obtain a representative sample of each child's behavior, the records were compiled under specified conditions. For example, the observation periods were rotated, thus avoiding the possibility of piling up records for any one child at one hour of the day. All records of free play were made out-of-doors and all records of routine activities, indoors. Half of the outdoor records were made during the first hour of the morning and half during the second hour. Not more than two records were made for a particular child in one day. No record of free play was made unless at least four children were present.

METHOD OF OBSERVATION

The procedure used with the recording technique necessitated a mimeographed blank to minimize errors of timing. An observer followed each child for a period of five minutes and recorded on this blank instances of laughing and crying, together with certain aspects of the total situation which accompanied the behavior under observation. The mimeographed sheet was ruled into sections of one minute and smaller units of ten seconds. Each time interval was numbered according to seconds on a stop watch. The record blank was divided into six columns. In the first column the observer recorded by means of a code the frequency of occurrence of laughing and crying within the ten second interval. In the next five columns the observer recorded specific activities in the situation which accompanied laughing and crying. These activities were social and physical contacts, talking, contacts with material, and physical activity unaccompanied by use of material.

The behavior recorded on this blank was defined in definite terms in order to render the data as objective as possible. Laughing and crying were identified in terms of physical changes in respiration and facial expression. Social contacts were recorded when the observed child appeared to make an overt sign of awareness of other individuals. Contacts with material involved actual use of

material. Physical contacts were defined as apparently intentional contacts with individuals as differentiated from accidental contacts. Talking included only actual use of distinguishable words. Physical activity, excluding use of material, involved such activities as running, jumping, and rolling.

TECHNIQUE OF ANALYSIS

The study of reliability was based on the total number of ten second intervals in which five observers, working in pairs, recorded the occurrence of an activity. One observer worked, in turn, with each of the other four, and percentages of agreement were computed between the records made by each pair of absences.

The consistency of the data was tested by (1) comparing the behavior of the children in this study with their behavior a year previous, (2) determining the correlation between samples of the data, and (3)comparing the results of this study with results of a contemporary observational study on these same children.

By recording the occurrence of behavior within a specific time, the data were rendered in quantitative form, thus making it possible to estimate the frequency of laughing as contrasted with the frequency of crying for each child and to relate these findings to that of the total group. It was also possible to find the frequency with which laughing was recorded with social contacts, physical contacts, talking, contact with material, and physical activity. These findings were compared with the frequency with which crying was recorded with the same activities.

The social significance of laughing and crying was studied by finding (1) the relationship between each child's laughing and crying and his association with the laughing and crying of other children, (2) the frequency with which each child was associated with particular children when laughing or crying, and (3) the frequency with which laughing and crying were associated with one individual or more than one individual.

Emotional behavior as indicated by laughing and crying was studied by finding (1) the relation of laughing and crying and (2) the relation of laughing and crying during free play and during routine activities.

Several factors which might have affected the behavior under investigation were selected for analysis. Correlations were made between the laughing and crying scores of the children and chronological age, intelligence quotient, height-weight indices, and amount of language. Sex differences and effect of temperature were also studied with respect to the incidence of laughing and crying. A brief discussion of some of the findings of this study follows. For detailed discussion the reader is referred to a monograph by Catherine Williams Brackett (2).

ANALYSIS OF THE DATA

The study of reliability indicates that errors of measurement have affected the recording of laughing and crying only to a slight degree. The percentages of agreement between four pairs of observers ranged from 92 to 93 per cent for the number of ten second intervals in which laughing was recorded, and from 93 to 100 per cent for the number of intervals in which crying was recorded. The activities occurring with laughing and crying were recorded somewhat less reliably partly because they were regarded as of secondary importance. The percentages of agreement between observers in recording the activities associated with laughing and crying were as follows:

	Per Cent of Agreement
Social contacts	77 to 92
Physical contacts	69 to 89
Talking	57 to 85
Use of material	83 to 92
Physical contacts (exclusive of use of material)	62 to 91

The consistency of the data was first tested by comparing the children's behavior in this study with their behavior a year previous when measured by the same techniques. The results indicated that there is some evidence to show that laughing is a highly consistent pattern of behavior. The children who ranked high in laughter at one age level tended to do so when a year older ($.75 \pm .10$).

Since crying was not recorded in the first study, no comparison could be made of this behavior.

The internal consistency of the data was tested by comparing for each of the twenty-nine children the frequency of occurrence of laughing and crying on (1) the first twelve records with the last twelve records, (2) the records made during the first hour of the morning with those made during the last hour, and (3) the odd numbered records with the even numbered. Correlations ranging from .56 ± .08 to .76 ± .05 were obtained for laughing and from .30 ± .11 to .53 ± .09 for crying. From this analysis it appears that laughing is a more consistent form of behavior than crying.

The third analysis for determining the consistency of the data was made by comparing the results of this study with the results of a contemporary study (1, p. 120 and 125) made on the same children. The comparison was justified by the similarity between techniques used by the two investigators. Correlations between results of these studies indicated that the children were consistent in the relative frequency of each child's laughing and crying. A coefficient of .80 ± .05 points to the fact that the pattern for laughing was somewhat more consistent than the pattern for crying (.63 ± .08).

Analysis of Social Behavior

Previous investigators have emphasized the social significance of laughing and crying. One of the main purposes of this study was to develop an objective technique which would measure the proportion of this behavior which appeared to be actually associated with other individuals as contrasted with the proportion which was nonsocial. Social contacts were observed in connection with 84.5 per cent of the total laughing and 78 per cent of the total crying; this bears out

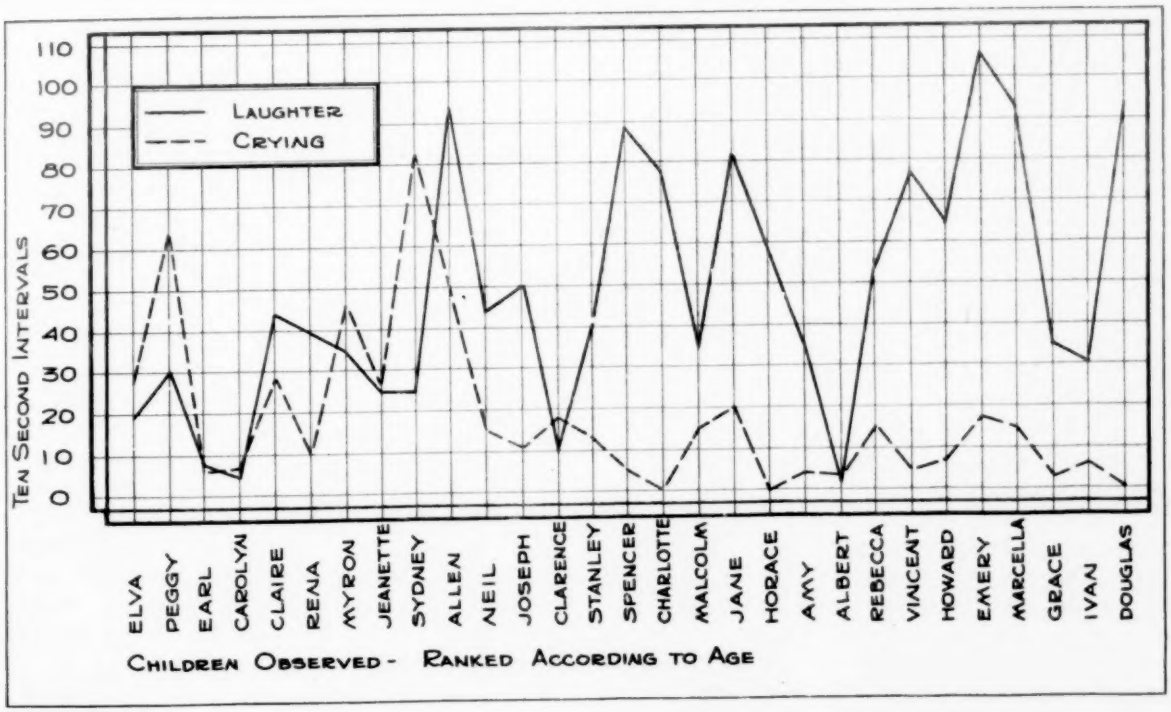

Figure 1

Relation of Total Laughter and Crying Per Ten-Second Interval on Twenty-Four Five-Minute Records for Each of Twenty-Nine Children.

the assumption that these responses were primarily associated with some form of social interaction (Figure 1). Physical contacts rarely accompanied laughing (20 per cent of total), while a large proportion of the crying (57 per cent of total) was associated with pushing, pulling, blows, or caresses. No attempt was made to differentiate these contacts into functional units. It is felt, however, that further study of the physical contacts which accompany laughing and crying would yield interesting data. Talking was associated proportionately the same with laughing (46 per cent of total) and with crying (41 per cent). Further study into the content of the conversation would probably reveal qualitative differences. Contact with material was recorded more frequently with laughter than with crying (84 per cent and 67 per cent). Physical activity unaccompanied by use of material rarely accompanied either laughing or crying.

Analysis of the association of laughing and crying of the observed child with the laughing and crying of other children brought out interesting differences with regard to these two aspects of behavior. It was found that those children who laughed frequently seemed to play more with others who exhibited this same behavior than with the more solemn members of the group. A correlation of .75 $\pm$ .05 was obtained between the frequency of the child's own laughter and the frequency of his presence in the group where others laughed (Figure 2). On the other hand, the children who cried were not associated with the crying of others to any marked degree (Figure 3).

There is some evidence that the children were beginning to show decided preference for particular members of their group. In both the two-year-old and three-year-old groups contacts associated with laughter tended to be concentrated on specific children rather than on the group at large. For example, among the two-year-old children there was a closely knit group consisting of one girl and three boys. Seventy-two per cent of their total social contacts recorded with laughter were associated with each other. There were two well-defined groups among the three-year-old children. Three boys who ranked high in number of social contacts recorded with laughter had 74 per cent of their contacts with each other. Two girls in the group had approximately the same percentage of their social contacts while laughing with one another. The majority of the children showed a similar tendency (though to a less degree) to confine a large proportion of their laughter to particular children. With crying this was not the case. Children who were associated with each other when laughter was recorded seldom cried when together.

There is slight evidence to show that with an increase in age there is a tendency for the size of the social group to increase, although a large percentage of the social contacts recorded for each child involved only one other person. Of the total social contacts recorded in both age groups, 19 per cent in the three-year-old group were associated with more than one person; this was true with only 6 per cent of the social contacts recorded in the two-year-old group.

Analysis of Emotional Behavior

The question may be raised as to whether the child who ranked high in laughing also tended to cry with great frequency. In this study there was no relationship between these two behavior patterns, as shown by the correlation of -.11 $\pm$ .11. This coefficient is consistent with the results obtained by other investigators who correlated laughing and crying ((1, p. 93) and (3, pp. 501-503)).

The nursery school day provided an excellent opportunity for the observation of children in a variety of situations. During the play period the children were relatively unrestricted in their activity. During routine situations such as eating, dressing, and toilet procedure the children were expected to conform to a rather definite routine. There was a marked decrease in both laughing and crying during routine activities as compared with the children's behavior during free play (Figures 4 and 5). The decrease in crying is contrary to what might be expected from general observation of children and is due no doubt to the skill of the nursery school teachers. Although the children's activity was restricted, apparently enough self-direction was maintained to prevent a feeling of being thwarted.

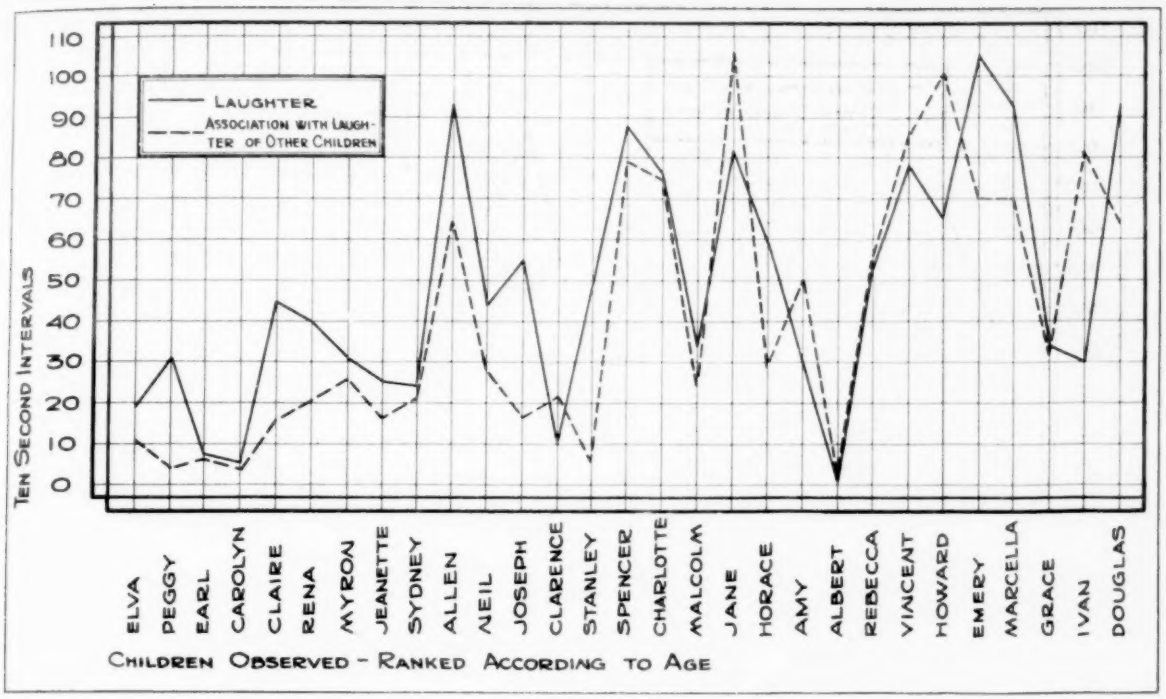

Figure 2

Relation of Total Laughter Per Ten-Second Interval on Twenty-Four Five-Minute Records for Each of Twenty-Nine Children and Association With Laughter on Records of Other Children.

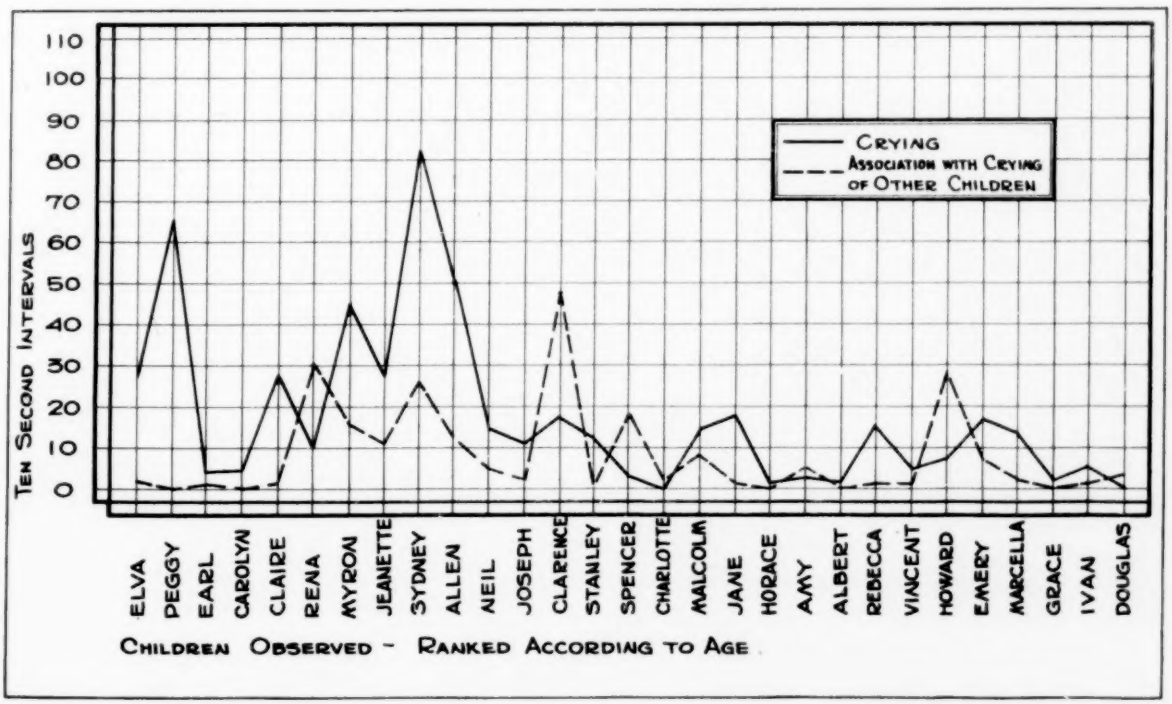

Figure 3

Relation of Total Crying Per Ten-Second Interval on Twenty-Four Five-Minute Records for Each of Twenty-Nine Children and Association With Crying on Records of Other Children.

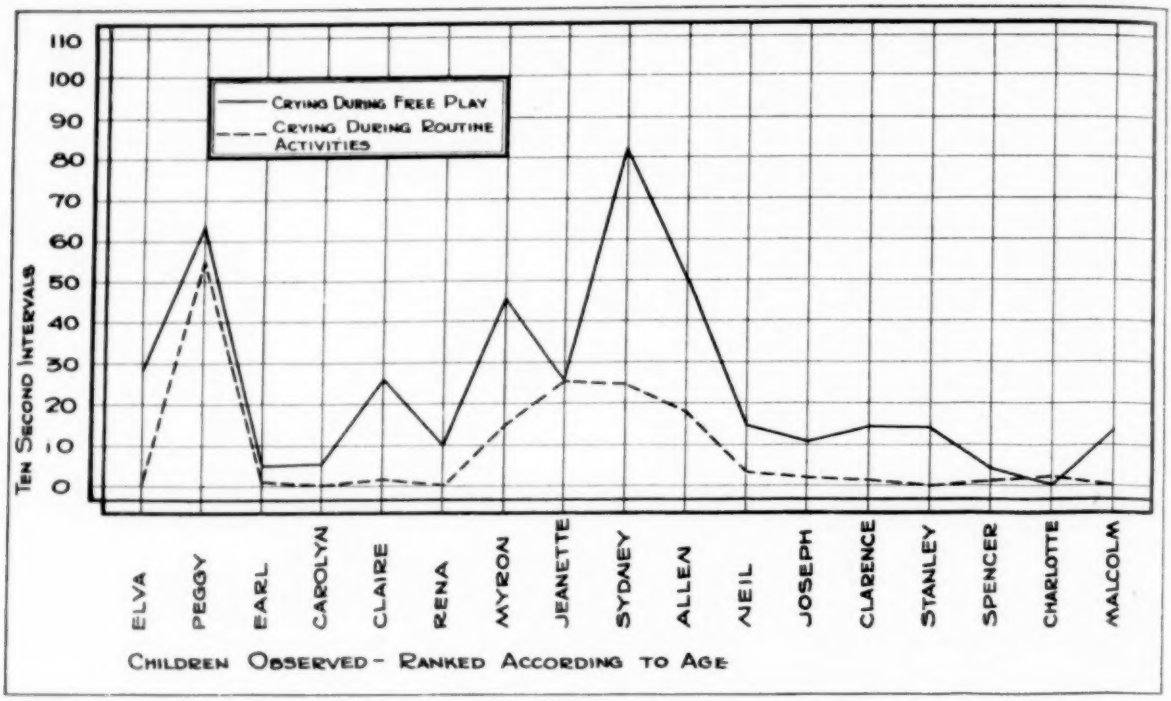

Figure 4

Relation of Total Crying Per Ten-Second Interval on Twenty-Four Five-Minute Records During Free Play and on Twenty-Four Five-Minute Records During Routine Activities for Each of Seventeen Two-Year-Old Children.

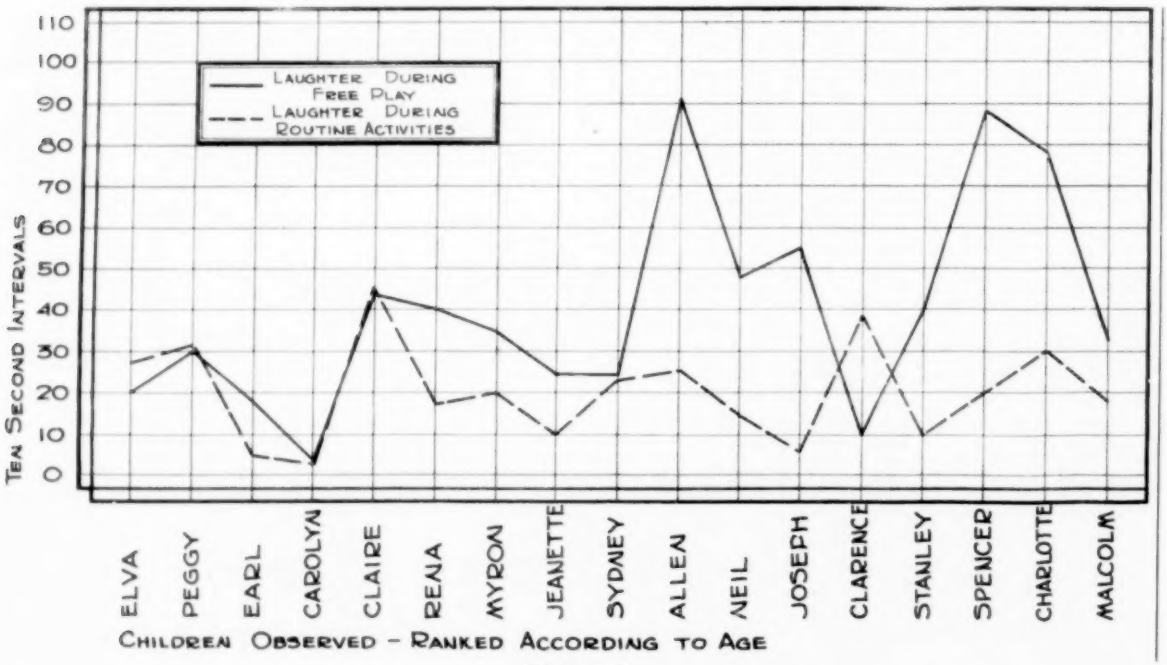

Figure 5

Relation of Total Laughter Per Ten-Second Interval on Twenty-Four Five-Minute Records During Free Play and on Twenty-Four Five-Minute Records During Routine Activities for Each of Seventeen Two-Year-Old Children.

Miscellaneous Factors Related to Laughing and Crying

Several factors which might have affected laughing and crying were selected for analysis. A Pearson correlation coefficient of .44 ± .10 was obtained between chronological age and frequency of laughing, and a correlation of -.47 ± .00 between chronological age and crying. These correlations suggest that with increase in chronological age there was a slight tendency for laughing to increase and crying to decrease. Variation in intelligence quotient and the relative weight of the subject in relation to his height and age had no demonstrable relation to the incidence of laughing and crying.

The amount of language a child used was determined from stenographic records made by trained observers. Correlations between scores on these records and frequency of laughing and crying indicated that there was a relatively high relationship between amount of language and laughing (.60 ± .08) and no relation between amount of language and crying (.004 ± .125).

Sex differences in frequency of laughing and crying were found to be negligible.

Temperature appeared to have no effect upon the incidence of laughing, but a decrease in temperature was usually accompanied by an increase in the occurrence of crying (-.58 ± .07).

CONCLUSIONS

From the results of this study some general conclusions may be drawn as to the value of the technique used and the significance of the behavior studied. The recording technique proved to be reliable, since four pairs of observers working simultaneously and independently were able to record laughing and crying with a high percentage of agreement. The technique was fairly reliable for recording activities associated with laughing and crying.

Laughing was found to be highly social, since children laughed most frequently when associated with other children or adults. Those children who ranked high in laughing seemed to prefer other members of the group who exhibited the same behavior. The majority of the children showed a tendency to confine a large proportion of their laughter to a few particular children. A large proportion of the social contacts recorded with laughter involved only one individual. The older children, however, frequently included two or more children in their group play. Laughter appears to be a highly consistent pattern of behavior. The children who ranked high in laughing during the play situations also tended to be consistent in this mode of expression during routine situations, but to a smaller degree. Consistency of this behavior pattern was also noted when records of the children's behavior were compared with records of their behavior made after a period of a year had elapsed.

Crying was also predominantly social, although to a less degree than laughing. The children who cried with great frequency were not associated to any marked degree with the crying of others. Children who had formed marked preferences for one another seldom cried when together, although some crying was noted with other members of the group. As age increased, laughing increased and crying decreased. The popular assumption that children tend to cry more frequently when their activity is restricted was not substantiated by the findings of this study. Crying decreased markedly in routine situations such as dressing, eating, or toileting as contrasted to activity during free play. It seemed that a knowledge of the definite routine of the nursery school during routine activities was conducive to a feeling of satisfaction and security. There was no indication that crying was used as a substitute for language since there was no relation between the amount of language and the frequency of crying. There was some evidence to show that the children who cried tended to have more physical contacts with other children and to use material less frequently than the children who laughed.

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THE USE OF CONDITIONING TECHNIQUES IN THE STUDY OF FORM DISCRIMINATION OF YOUNG CHILDREN[1]

by
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Form boards have been used rather extensively by different experimenters as a means of measuring the ability of children of different ages to observe form differences and to see the relationship of like configurations in block and recess materials. Similarly card matching tests have been used as measures of form discrimination.

In a study of form board accomplishments of preschool children made by the author (4) certain geometrical form boards were simplified as to number and difficulty of forms to be applicable as a test for two-year-old children. The data show that number of errors is sufficiently high at the two-year level to rule out the form board as being in any sense of the word a measure of form discrimination. The fact that the child failed to see the relationship between a circle block and a circle recess and instead attempted to place the circle block in the square recess does not necessarily indicate that the child failed to discriminate circle from square. It may simply mean that he is not able to see the relationship of like forms in different elements (circle block as related to circle recess).

In view of the complex factors involved in the use of form boards and card matching, an attempt has been made to develop a more simple technique by which form discrimination as such in young children could be measured. After repeated experimentation with different types of materials, the form discrimination boards (later described) involving conditioning techniques were found to meet the needs satisfactorily.

Very few studies have been reported where conditioning techniques have been used in experimental studies with young children, especially in the measurement of form discrimination.

Munn (3) has used a conditioning situation to study the relation of form to its accompanying background. He was interested in studying, (1) whether or not shape of background on which a form appeared was essential to the accuracy of the discrimination of the form, and (2) whether or not it was possible to obtain in the young child the discrimination of form per se that could not be demonstrated in the chick. His subject was one child fifteen months old. The apparatus was a box with two doors hinged from the top. Form configurations to be discriminated were placed on the doors in such a way that either figure or background could be changed at will. As a reward for success the child was given chocolate. The results showed that type of background was not an effective part of the stimulation. Changes in negative form led to no significant drop in accuracy of choice.

Aldrich (1) has used simple conditioning as a method of determining relative sensory discrimination among mentally defective children. Ten feeble-minded children ranging in mental age from one year, five months to three years, three months were used. Chronological age ranged from three to twelve years. Size discrimination was studied. The child was required to raise one of two boxes differing in size in order to secure the reward of food (cooky). Position of boxes varied from trial to trial. Eighteen correct choices out of twenty was taken as the standard for successful conditioning in a situation where chance might account for 50 per cent of the correct choices. Results indicated that the method proved satisfactory in the first discrimination problem with seven of the ten children. Greater variations occurred when reconditioning to a different size was introduced.

1. Acknowledgment is made to Dorothy E. Bradbury for her valuable assistance in the preparation of this manuscript.

Fields' (2) study on the development of the concept of triangularity by the white rat not only considers in detail the ability of the white rat to discriminate form, but also evaluates various factors involved in such discrimination and their relation to procedures in conditioning. Results which are especially related to the form conditioning series of the present study are: (1) Rats are able to discriminate one form (triangle) from another (various forms); original learning was to a triangle in a given position (apex up). Positional changes of the form caused confusion which was overcome in time. (2) Variations in areas of figures did not destroy the accuracy of discrimination. (3) Triangular configurations of negative (circle) forms were successfully discriminated as being triangular. (4) Discrimination was essentially a positive reaction to triangular forms rather than a negative reaction to other forms. (5) Form discrimination was evidenced when figures were white on a black background and also when figures were black on a white background.

DESCRIPTION OF FORM DISCRIMINATION BOARDS

The form discrimination boards used in this study utilize conditioning techniques to measure the child's ability to discriminate form. By conditioning is meant the presentation of two stimuli at first together (as the showing of the form followed by the showing and receiving of the reward) then with subsequent trials, the form only, until a selection has been made.

Two form discrimination boards were used in this form conditioning series. One was composed of geometrical forms and the other of animate and inanimate object forms. The form boards and blocks were made of kiln dried birch. Hard wood was used in order to give greater accuracy in dimensions and in amount of play. All board surfaces were an antique ivory matte finish with recesses and blocks of brilliant scarlet.

The geometrical form discrimination board (Figure 1) had four forms: circle, square, lozenge, and Maltese cross. This board measured 12 7/8 inches square. This form conditioning board was similar in every way to the form board (Figure 3) later referred to in comparisons of form board performance as related to form discrimination except that, instead of having bottoms in the recesses of the form discrimination board, aluminum cups were placed underneath each of the four form recesses.

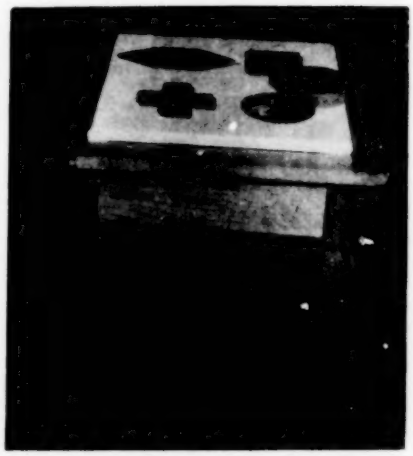

Figure 1. Geometrical Form Discrimination Board, Form Conditioning.

The board was so constructed that the blocks might be removed from the recesses in the same manner as with the ordinary form board. When a block was removed, however, it showed the cup container underneath.

The second form discrimination board (Figure 2), the object form discrimination board, was identical in size with the geometrical board. It consisted of a frame with four square sections which were removable. Each of the four sections had one cut-out form recess with the block of a similar form which fitted into the recess. The object form discrimination board was made in four sections for two reasons: (1) to permit object forms to be presented "right side up" irrespective of the way the board was turned and irrespective of the relative position of the sections in the board, and (2) to permit varying certain sections of forms while keeping others constant.

The four forms include: dog (standing), duck, house, and car. Additional sections used include: dog (sitting), chicken, pitcher, cup, baby, bear, horse, cow, and a form with the dog's head and a so-called "meaningless" body. Each form has a metal cup container underneath.

Figure 2. Object Form Discrimination Board, Form Conditioning.

A table standard consisting of four legs and a frame was constructed to hold the form discrimination boards. Two additional extensions for the table legs were made so that the height of the table frame might be varied according to the size of the child.

PRESENTATION

Forty-one children ranging in age from fifteen to forty-six months were used as subjects. Eight of these children, secured from private homes, constituted the pre-preschool group ranging in age from fifteen months to twenty-three months. Thirty-three children of the preschool laboratories of the Iowa Child Welfare Research Station made up the older group with ages from twenty-three months to forty-six months.

With the two- and three-year-old children of the preschool laboratories it seemed desirable to conduct the conditioning series in connection with the daily cooky and sandwich routine. At mid-morning the two-year-old children (First Group) receive a glass of orange juice followed by a cooky. A plan was, therefore, adopted whereby each child would come singly to the examining room to get his cooky from the form discrimination board. In this way all children could be given one trial a day without using more than twenty minutes time for the entire group. The three-year-old children (Second Group), remaining in preschool all day, receive a glass of milk and a sandwich in mid-afternoon. Similar arrangements were made whereby each child came to the examining room and received his sandwich from the form discrimination board.

Geometrical Form Discrimination Board

Preschool Children.- The circle was used as the first positive stimulus form

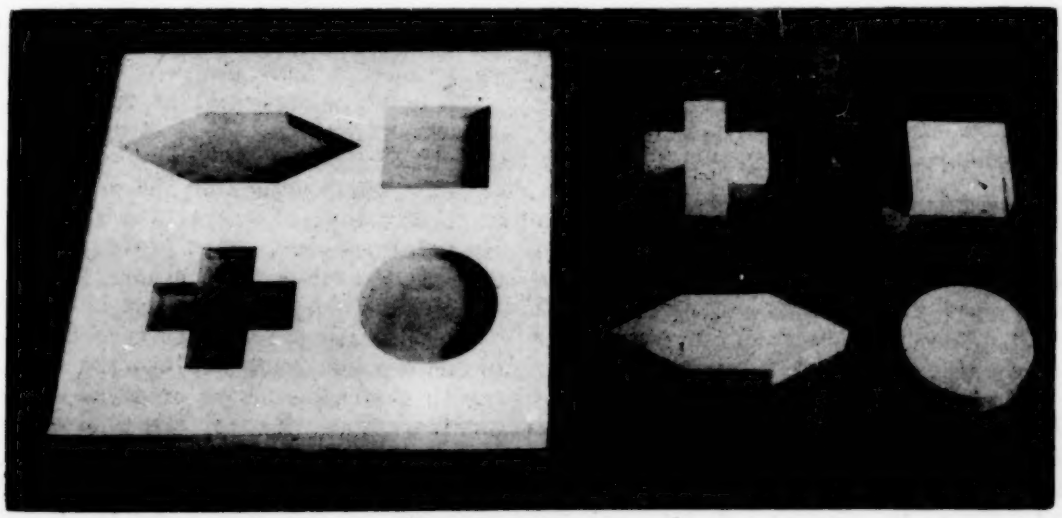

Figure 3. Four Form Four-Unit Board, Geometrical Form Boards.

followed by the square, lozenge, and Maltese cross. When the child came up to the board, it was so placed that the circle was in the lower right-hand corner. The examiner then raised the circle showing the child the cooky and stated, "There is your cooky." The circle was then replaced and the examiner next raised the cross saying, "There is no cooky there," simultaneously pointing and pausing for the child to see that nothing was contained in the cup. The examiner then replaced the cross and similarly raised the lozenge and the square stating, "There is no cooky there." The examiner then instructed, "Get your cooky," pointing to the circle. The examiner made certain that the child secured his cooky on the demonstration trial.

At the second trial the board was presented with the circle in the same position as on the first trial. The examiner merely instructed, "Get your cooky." The child was then allowed to select only one form. If successful, he took the cooky and left the room. If not, the examiner stated, "No. This is where your cooky is." At the same time the examiner lifted the circle and showed the cooky. With failure the child was not permitted to get his cooky but told that he must get it in the other room.

For the third trial the board was turned so that the circle occupied the lower left position. Similarly with the next two trials the circle occupied the upper two positions. Since the only objective in position change was to rule out any tendency to select by position, no attempt was made to keep position changes constant for all children irrespective of absences. The positive form appeared a relatively equal number of times in all positions, being always in a different place from the previous trial (except the first trial following demonstration).

Each child was kept on a positive stimulus form until a given standard of success in conditioning had been reached. Inasmuch as such factors as divided interest, carelessness, and curiosity might account for an occasional failure with the young child, it was thought impractical to set a standard of ten consecutive successes. Instead the standard was arbitrarily set at eight or more successes out of the last ten trials.

When this standard of success had been met, the child was changed to the next positive stimulus form (square); the previous form (circle) then became a negative form. A demonstration was again given similar to the first. The examiner stated, "Your cooky will not be here any more (raising the circle block); now it is going to be here (raising the square block)." The remainder of the procedure was as of the first demonstration. Similarly, the lozenge and Maltese cross became in turn the positive stimulus form.

Pre-Preschool Children.- Since the preschool children were too old to furnish a failure form board group to compare with performance on the conditioning board, it was decided to use some younger children not in preschool whose initial form board performance was failure or resulted in a sufficient number of errors to rule out any evidence of form discrimination as measured by a form board test. The objectives of this comparison were: (1) to determine whether children who failed on form boards or made so many errors that no measure of form discrimination was evidenced were able to discriminate form when other factors involved in form board performance had been ruled out; (2) to determine whether, after being conditioned to a specific form, the child would see the relationship between two similar forms (as a block and its similar recess) in the form board situation; and (3) to ascertain whether or not there was any practice effect carried over from the form conditioning situation to the form board performance in general.

Eight pre-preschool children ranging in age from fifteen to twenty-three months were used in this comparison.

The older groups of the preschool laboratories previously described were given only one trial per day. This prolonged the learning period over a considerable length of time. With the pre-preschool children it was thought more economical to give several trials in one day and thus complete the conditioning in a minimum number of days. With these considerations in mind, the plan of presentation described below was adopted.

Only one form was used as a positive stimulus. A form was selected for this purpose which was less likely to be correctly placed by mere motor chance in the form

board situation. The Maltese cross was, therefore, selected as the positive stimulus form for six of the eight children. The other two children were given the lozenge to study the effect of configurational change with position change. Other forms of the form board would show the same configuration irrespective of the position of the form in the board.

The child was presented with the positive stimulus form only in the two positions next to the child in the first conditioning unit. Aldrich (1) in her conditioning study with idiots, where only two positions were involved, changed positions in 100 trials according to the variation found by tossing a penny 100 times. This meant that at certain times the positive stimulus was in one position as high as five times consecutively. It would seem to the writer that such a procedure with young children might strengthen a position cue rather than the desired form cue.

A modified alternation method was, therefore, used. For a few trials the positive stimulus form would be alternately to the left and to the right. Then for a few trials, two consecutive trials would be given with the positive stimulus form to the right (or left) followed by one trial with the form to the left (or right), and vice versa. Since the positive stimulus form was always in one of the two nearer positions, the requirement set for a successful indication of form discrimination was placed at eleven successes out of the last twelve trials.

If the child successfully completed the conditioning series with the positive stimulus form in the nearer two positions, he was presented with the same positive stimulus form appearing in all four positions. Here again the standard for successful evidence of form discrimination was placed at eleven successful trials out of the last twelve trials. In some instances where form discrimination in the nearer two positions seemed close to the limen, the examiner used an intermediate step in which the board was placed on an angle with the child. The positive stimulus form then occupied a position about halfway from the form in the nearer position and that of the regular farther position. This was done to avoid possible failure due to such factors as not noticing the positive stimulus form in a more distant position. If the child was successful with the intermediate position, the form next appeared in the farther position. If he failed, a second trial was given in the intermediate position before progressing to the farther positions.

Since the object with this group was not primarily to determine the relative speed at which children conditioned to a positive stimulus form, but rather to determine whether they could or could not successfully discriminate form, the number of trials given per day was not held constant for all children. Each child progressed according to his own tempo. If on a given day a child became tired or fretful after a few trials, work was discontinued for the day. On the other hand, if the child was interested and contented, more trials were given. After each trial the child was permitted to play in the preschool playroom for a few moments before being given the next trial.

Obviously since several trials were given in one day, the cooky or sandwich reward could not be used. Instead a small toy was used. If the child was successful, he was allowed to remove it and play with it. If he failed, he was shown the toy but lost his chance to play with it after that trial. A large number of different toys were used as rewards in order to add an element of novelty to the problem.

Form Board Comparisons.- Three presentations of a four form four-unit geometrical from board (Figure 3) described in Skeels' study (4) were given in conjunction with the form conditioning unit. One presentation was given immediately preceding the start of the conditioning series, a second as soon as the observer had reached the standard of success required in the nearer two positions, and a third when the standard of success had been reached with the positive stimulus form in all four positions.

Two trials were given at each presentation. Position of the board was such that the form (board recess) which was to be (or had been) the positive stimulus form in the conditioning series was in one of the nearer two positions. Blocks were so arranged that the block of the positive stimulus form was

also in a nearer position but not next to the recess of the same form. Position of the board in the second trial was the same as that for the first trial.

Object Form Discrimination Board

This series was presented only to the preschool groups. As soon as a child had completed the geometrical form discrimination series, he was started on the object form discrimination series (Figure 4). In

Figure 4. Child Looking for Reward, Geometrical Form Discrimination Board, Form Conditioning.

contrast to the procedure of the geometrical form discrimination board, the negative forms always remained negative and the original positive form was used with various modifications. In the original conditioning the standing dog was used as the positive stimulus form in conjunction with duck, house, and car as negative forms.

Presentation was the same as that described for the geometrical form discrimination series with the same group. Eight successes out of the last ten trials constituted a satisfactory conditioning to the original positive stimulus form. At that state variations were introduced. Each variation received only one trial after which the original positive stimulus form and original negative forms were presented as a reconditioning series. The purpose of this was to reëstablish or maintain the original stimulus reward bond which might tend to be broken down by variations. Reconditioning was continued until four out of the last five trials were successes. The next variation was then presented. In presenting variations of the positive stimulus form, if failure ensued, the examiner would now show where the reward was but rather requested the child to get the cooky (sandwich) from the other room.

Variations were presented as follows:

1. Substitution of the sitting dog for the standing dog accompanied by the original negative forms--duck, house, and car
2. Standing dog with substitution of new negative forms--cup, pitcher, and chicken
3. Substitution of positive form variation (sitting dog) and new negative forms--cup, pitcher, and chicken
4. Both dog forms and two of the original negative forms (Note: This followed variation number 3 without an intervening reconditioning period. This was an attempt to see which of the two types of positive stimulus forms involving recency and frequency would be selected. Rewards were placed under each form.)
5. Substitution of irrelevant positive form (baby) accompanied by original negative forms
6. Substitution of a form made up of a part of the positive stimulus form (head of dog and "meaningless" body) with original negative forms
7. Standing dog with three other animal forms--bear, horse, and cow.

Care was taken in presenting variations that these did not occur on days following vacations or absences, which might be credited as a cause of failure.

RESULTS

Of the forty-one children used on the geometrical and object form discrimination boards only one failed. In 100 trials that child secured a 70 per cent (seven correct choices in ten consecutive trials) accuracy at several different periods during the 108 trials which he was given.

Techniques of conditioning employed were applicable at all ages, including the youngest child of fifteen months. Children readily grasped the idea of selecting a form and finding the reward (toy, sandwich, or cooky).

Geometrical Form Discrimination Board

Preschool Children.--All but one of the thirty-three children of the preschool group reached the success standard (eight successes out of ten consecutive trials) on the first positive stimulus form. Many children were successful without taking any learning trials. (Learning trials refer to trials over and above the ten required for the success standard.) The range for the group on number of learning trials was from 0 to 80, with a mean of 7.74 and a standard deviation of 15.80. A more representative number is that of the median which was 3 learning trials.

The ten two-year-old children (mean age 26.7 months at time of beginning conditioning series) and the sixteen three-year-old children (mean age 36.5 months at time of beginning conditioning series) have been compared by age groups:

Age, Years	Learning Trials		
	Mean	S.D.	Median
2	7.70	13.28	1.5
3	9.00	18.97	2.5

The number of learning trials seems to have very little relation to chronological age. The two-year-old children appeared to take less learning trials than did the three-year-old children. This was further evidenced by the correlation with chronological age, all ages combined (twenty-three months to forty-six months) on thirty-one children. Learning trials with chronological age gave a correlation of $-.08 \pm .12$. A similar comparison with mental age gave a correlation of $.00 \pm .12$. Learning trials on the first positive stimulus form have practically no relationship to either chronological or mental age.

During the course of the conditioning series twenty-six children met the standard of success for the first and second positive stimulus forms. Comparisons for all ages combined (mean age of 35.58 months) follow:

Children	Mean	S.D.	Median
First Form (Circle)			
26	3.57	4.75	1.0
Second Form (Square)			
26	9.77	17.38	1.5

Taking age groups separately:

Children	Mean Age, Months	Mean	S.D.	Median
First Form (Circle)				
7	26.14	1.29	2.05	0
15	36.67	4.13	5.11	2
Second Form (Square)				
7	26.14	27.29	24.41	18
15	36.67	3.20	6.65	0

Here we have a marked difference between age groups. The three-year-old children made the change to the new positive stimulus form more rapidly than did the two-year-old children. With such small numbers of cases, however, these differences are merely suggestive.

Correlations were obtained on this group (both ages combined) for the first and second forms with chronological and with mental age as follows:

Children	First Form r P.E.	Second Form r P.E.
Mental Age		
26	$.15 \pm .15$	$-.47 \pm .15$
Chronological Age		
26	$.25 \pm .13$	$-.60 \pm .09$

The adjustment of a new situation, requiring the breaking down of an old positive stimulus bond and the building up of a new positive stimulus bond, appears to be somewhat related to both mental age and chronological age, whereas, original learning was unrelated or slightly inversely so.

During the course of the conditioning series twenty children (three- and four-year-olds) completed the geometrical series, having reached the success standard for each of the four forms as a positive stimulus form. Due to the small number of four-year-old children, comparisons have been made only on the three-year-old group of fourteen children with a mean chronological age of 37.07 months.

Positive Stimulus Form	Learning Trials		
	Mean	S.D.	Median
First (Circle)	3.14	4.22	1.5
Second (Square)	1.93	3.06	0.0
Third (Lozenge)	1.93	3.15	1.0
Fourth (Maltese cross)	5.24	6.78	4.0

The rise in number of trials for the fourth form is rather difficult to explain. The fact that all forms had at one time been positive stimulus forms may have caused some confusion. Interest was waning by the time the fourth form was reached. Christmas vacation intervened just as several of the three-year-old children were partly through the fourth form conditioning. These children required more learning trials after the vacation although the general tendency of time lapses seemed negligible.

Children varied in the speed of progress made on the four positive stimulus forms. One child, F693, required only five learning trials for the first positive stimulus form and seventy-three trials for the second positive stimulus form. Failure choices were consistently that of the first positive stimulus form. The same child required no learning trials for the third form. Time did not permit the child to complete the fourth form conditioning. Another child, M639, required eleven learning trials on the first form, but made the change to subsequent positive stimulus forms with only two learning trials for the third form. In some cases, M585 for example, success was reached without learning trials until the fourth form.

An analysis of total errors made by the group following the introduction of the second positive stimulus form showed that, of the total number of errors made, 75 per cent were those of a perseveration in the selection of the previous positive stimulus form. This furnishes further evidence that children definitely did discriminate form.

The position of the positive stimulus form in relation to the number of errors made was studied to ascertain the effect of position on performance. All comparisons were made as of the position of the positive stimulus form. Position I is that position of the board in which the positive stimulus form appears in the lower right corner, Position II in the lower left, Position III in the upper left, and Position IV in the upper right. The following tabulation shows the percentage of errors made in form selection when its positive stimulus form occurred in each of the four positions:

Positive Stimulus Form	Percentage of Errors	
	Two Years	Three Years
Position I	19	16
Position II	16	22
Position III	33	32
Position IV	31	29

Both groups made a higher percentage of errors when the positive stimulus form appeared in the upper positions which were farther removed from the child. In another comparison the two upper positions were considered together as a unit and the two lower positions were taken together as another unit. Comparisons of the positive stimulus form in the upper positions and lower positions show that of the total number of errors with the two-year-old children 65 per cent occur when the form was in the upper positions, and only 35 per cent when it appeared in the lower two positions. With three-year-old children 62 per cent of the total number of errors were made when the positive stimulus form appeared in the upper positions, and only 38 per cent when it occurred in the lower positions.

Left and right comparisons have been made by combining the errors for the two positions on the left side (Positions II and III) against errors for the right side (Positions I and IV). With two-year-old children 49 per cent of the total errors occurred when the positive stimulus form was on the right side, and 51 per cent when the positive stimulus form was on the left side. A different relationship occurred for the three-year-old children. With the positive stimulus form on the right side, only 46 per cent of the total number of errors occurred, whereas 54 per cent occurred when the positive stimulus form was on the left side. Little difference occurred from left to right for two-year-old children, but for three-year-old children fewer errors were made when the form occupied positions on the right side.

Other studies on the same children have indicated that the two-year-old group was ambidextrous and that the three-year-old group was predominantly right-handed. This difference may, therefore, be due to handedness. Both groups show consistent tendencies to make more errors when the positive stimulus

form was in the most distant positions (upper position).

Comparison of Performance on Form Boards and Form Conditioning of Children Below Two Years of Age.—In order to make a direct comparison between a form board failure group and performance on form conditioning, a group of eight pre-preschool children were given a four form four-unit geometrical form board (Figure 3) described by Skeels (4). They were "conditioned" to a positive stimulus form on the geometrical form discrimination board. These eight children, four boys and four girls, ranged in chronological age from fifteen to twenty-three months. Mental ages ranged from seventeen to thirty-five months.

Three presentations, two trials each of the four form geometrical form board, were given: one preceded form conditioning, one followed successful discrimination of the positive stimulus form in the nearer two positions, and one followed successful discrimination with the positive stimulus form appearing in all positions.

All children were successful in meeting the standard for success (eleven successes out of twelve consecutive trials) on the geometrical form discrimination board when the positive stimulus form was presented in the nearer two positions. Only two children failed to reach the success standard when the positive stimulus form was later included in all four positions. Learning trials required for reaching the success standard are given by child in the following tabulation:

Child	Age, Months	Learning Trials Required	
		Nearer Positions	All Positions
M1C1	15	5	
F1C2	18	6	0
F1C3	18	15	2
M1C4	19	9	0
M1C5	19	6	0
M1C6	19	29	
F772	23	20	0
F771	23	2	0

With the positive stimulus form in the nearer positions, learning trials required ranged from two to twenty-nine with very little relation to chronological age. In general, once the conditioning had been built up with the positive stimulus form in the nearer two positions, this carried over for the two farther positions without additional learning trials. If, in the second conditioning with positive stimulus form appearing in all positions, the success standard had not been reached in six or eight learning trials, the examiner did not continue the series longer. Children whose form discrimination on the discrimination board broke down when the positive stimulus form was included in the farther positions were not given the third presentation on the form board.

The following facts were observed: (1) No evidence of form discrimination was shown by performance on any of the form board presentations. Performance was largely made up of incompletes and failures. Where successes occurred numbers of form errors indicated a lack of ability to see relationships of blocks to recesses. (2) There seemed to be no improvement on form board performance after experience with the form discrimination board. (3) Little or no practice effects were evidenced with repeated presentations of the same form board.

An analysis of form errors, made on attempted placements of the form which was used as the positive stimulus in the form discrimination board, showed no decrease in later presentations following form discrimination practice on the conditioning series. In the first presentation the positive stimulus form was used in fourteen trials with a total of twenty form errors; in the second presentation it was used in fifteen trials with a total of twenty-six errors; and in the third presentation it was used in twelve trials with twenty-four errors.

A further comparison was made with first attempts at placement of the form used as the positive stimulus. Record was made of the first placement or attempted placement in each trial of each presentation. In the first presentation (two trials for each of the eight children or sixteen total trials) only one correct placement resulted. In the second presentation (representing sixteen trials) one correct placement and one attempted correct placement occurred. In the third presentation (representing

twelve trials) only one attempted correct placement was made. Chance would account for more than the number cited.

A further comparison was made between the form board and the conditioning board performance in relation to the first block that the child picked up when making form board placements. In the first presentation the positive stimulus form was the first block to be picked up five times in sixteen trials. Since there were four blocks from which to choose we would expect this result from chance. In the second presentation the positive stimulus form block was the first to be picked up twelve out of sixteen trials. In the third presentation this block was first eleven out of twelve trials. Discrimination of the positive stimulus form as such carried over to the form board situation, bringing about a first choice of this form. However, this did not carry over to block placements; the child was as likely as not to try his positive stimulus form in a different form recess.

Object Form Discrimination Board

The problem situations of the object form discrimination board were arranged for the purpose of studying some factors related to the learning involved in the conditioning techniques employed. The object form discrimination board was so constructed that changes could be made (1) in the positive stimulus form (the form associated with the reward), and (2) in the negative stimulus forms (forms associated with the absence of rewards). These changes could be made separately or simultaneously depending on the aim of the specific problem.

Original conditioning was with the dog (standing position) as the positive stimulus form accompanied by the three negative forms --duck, house, and car. Children were started on the object form discrimination board as soon as they had been conditioned to the fourth positive stimulus form of the geometrical form discrimination board. All of the children that were started on the geometrical board did not participate in the problems of the object board. Of those who did start, not all completed the tests before the end of the school year. As problems progress, of course selection takes place. If the series could have continued (indefinitely) until all children completed the tests, results would be more comparable.

Twenty-three children were conditioned to the original positive stimulus form (standing dog). Twenty-two reached the standard of success (eight correct choices out of ten consecutive trials) within twenty or less learning trials. One child had not reached the standard in thirty-three learning trials. Learning trials by age groups and combined for the nine three-year-old children (mean age 36.44 months at the beginning of this series) and the thirteen four-year-old children (mean age 45.92 months) are as follows:

Age, Years	Mean	Standard Deviation	Median
3	4.11	6.62	1
4	1.69	3.50	0
Both	2.24	4.88	0

Number of learning trials for three-year-old children on this discrimination board was about half that for the first form of the geometrical form board. Practice from the first discrimination board may account for the differences.

Correlations between number of learning trials and mental and chronological age based on twenty-one children, thirty to fifty months of age, show practically no relationship to chronological age but some relationship to mental age. (Correlation of learning trials with chronological age was $-.17 \pm .15$, with mental age $-.46 \pm .12$.) Correlation with mental age is similar to that obtained for the second positive stimulus form of the geometrical form discrimination board.

Following the original conditioning to the standing dog form, seven problem variations were presented with intermittent reconditioning trials using the original forms. With a change of the form of the dog, only two of the twenty-three children made wrong selections. When new negative forms were introduced with the original standing dog, all but five children out of twenty-one made correct selections. Fewer children failed when changes were made with both positive and negative forms than when changes were

made on negative forms alone; the differences were small, however. This is probably accounted for by the fact that this double change occurred following an earlier presentation of each change singly. When both positive stimulus forms were presented together, the standing dog being the most frequent positive stimulus (frequency) and the sitting dog being the most recent positive stimulus (recency), one-half of the children selected the former and one-half the latter. With the removal of the positive stimulus form and the substitution of an irrelevant form with the original negative forms, 80 per cent of the children made correct choices.

Little difficulty was encountered when the partial positive stimulus form embodying the head of the original stimulus and an angular (supposedly "meaningless") body configuration was presented with the original negative forms. The greatest amount of confusion resulted when three animal forms (bear, horse, and cow) were presented with configurations similar to that of the positive stimulus form. Only 67 per cent of the children made correct selections when similar forms were presented together.

SUMMARY AND CONCLUSIONS

A series of two form discrimination boards involving the use of conditioning techniques were used in the measurement of form discrimination in the young child. One form discrimination board made use of geometrical forms and the other of forms of animate and inanimate objects. Comparative performance on a similar geometrical form board was evaluated in terms of form discrimination as evidenced in the form conditioning series. Forty-one children ranging in age from fifteen months to forty-six months were used as subjects.

The results may be summarized as follows:

1. The use of conditioning techniques with the form discrimination boards proved adequate as a measure of form discrimination.

2. Ability to discriminate the forms at all age levels was evidenced by performance on the form discrimination boards.

3. Genetically the ability to discriminate form seemed to appear before the ability to see the relationship between two units of the same form.

4. No evidence of form discrimination appeared on any of the form board presentations with the pre-preschool group.

5. Practice on the form discrimination board did not affect subsequent form board block placements. Experience with the positive stimulus form in the form discrimination board brought about more frequent initial selection of that block form for attempted placement.

6. Once a bond had been built up between a stimulus form and a reward, certain modifications of the problem unit could be made without breaking down this bond.

7. Association between form and reward appeared to be made up of both "positive stimulus with reward" bonds and "negative stimulus without reward" bonds. In the absence of the positive stimulus form, children made selection on a basis of negative forms.

8. Negative forms with configurations similar to the positive stimulus form caused more confusion than did changes in configurations of positive or negative forms or both in which dissimilarity still existed.

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MOTIVATION OF YOUNG CHILDREN: THE CONSTANCY OF CERTAIN BEHAVIOR PATTERNS[1]

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This study reports a retest of 102 children tested three years previously on the Chase (2) motivation hand dynamometer. The purpose of Chase's investigation was "to obtain data on the relative effectiveness of a number of different types of external incentives which have been given under controlled and experimental conditions with four comparable groups of children ranging in age from two to eight years." (2, p. 31) These groups were designated by the letters A, B, C, and D, respectively.

Each child was given three series of strength tests at intervals of one week on a hand dynamometer devised especially for the Chase study. Each series consisted of seven trials on the strength test; only the scores of the last six were used in the computations. In the first test, Series I, the children in all groups received the same instructions with no knowledge of results, the recording apparatus being concealed behind a screen.

In Series II, given one week after the first, a separate procedure was followed for each of the four groups. Group A, known as the control group, was given for the first, second, and third weeks the same procedure with no knowledge of results. Individuals in Groups B, C, and D, irrespective of their performance scores, were made to believe the second week (Series II) that through their efforts they had succeeded in ringing a bell which had actually been rung from a button pressed at the appropriate moment by the experimenter's foot. Group B, following the success on each of the seven trials, was given a mere repetition of the instructions: "I want you to try again. When I say 'ready squeeze,' I want to see if you can make the bell ring. Ready, squeeze." Following the success on each of the seven trials, Group C was praised in the language and manner described by Chase (2, p. 67). Group D, following the success on each of the seven trials, was given a reward in the form of a gold star which had been promised on the condition of ringing the bell.

During the third week the tests and situations in Series III were given. Each child in Group A, as stated, received the same control-motivation as was given in Series I and Series II, that is, no knowledge of results and a mere repetition of instructions. Individuals in Groups B, C, and D, irrespective of their performance scores on the seven trials of this series, were led to believe that they had failed to ring the bell. Group B was given a repetition of instructions as in Series II after failure to ring the bell on each of the seven trials. Following each of the seven successive failures, Group C was reproved as described by Chase (2, p. 68). Each child in Group D, after each respective failure, was supposedly punished by having a red button cut off a paper "gingerbread boy" which had previously been given to him with the warning that the experimenter would be obliged to cut off a button each time he failed to ring the bell.[2]

The tabular form on the following page will give a more concise presentation of the plan for the various motivational situations according to groups of children and

1. Acknowledgement is made to Dorothy E. Bradbury for her valuable assistance in the preparation of this manuscript.
2. See Chase (2, p. 68) for complete directions and procedure in giving the three experimental test presentations.

the successive series of tests administered at weekly intervals:

	Series I	Series II	Series III
Group A	Control-motivation	Control-motivation	Control-motivation
Group B	Control-motivation	Success-repetition	Failure-repetition
Group C	Control-motivation	Success-praise	Failure-reproof
Group D	Control-motivation	Success-reward	Failure-punishment

As a part of the Chase study, all children were given an additional perforation test to determine the relative amount of carry-over effect from one motivated task to another. The perforation test will not be discussed, since it was not used in the present study.

Chase had a number of specific questions which she set out to answer (2, p. 31). The answers based on the findings of the study may be summarized briefly as follows:

1. Some motivation is more effective than control motivation for the performance of a task irrespective of whether the additional motivation be success or failure.
2. The chances are that some motivation in addition to success is more effective than merely asking the subject to repeat a performance in which he has been successful.
3. It is highly probable that some motivation in addition to knowledge of failure is more effective than merely requiring the subject to repeat the task.
4. The chances are that success-reward is more effective than success-praise although the difference between group means for the two is not statistically significant.
5. Failure-reproof and failure-punishment are about equal in effectiveness, the group mean for failure-reproof being insignificantly higher.
6. Performances average significantly higher under conditions of failure-repetition than under success-repetition.
7. The performance of the subjects was significantly higher when they were reproved for failure than when they were praised for success.
8. The chances are that failure-punishment is more effective than success-reward.

The general objective of this investigation was to repeat the Chase study on those children tested three years earlier who were still available and to make a comparison of the children's performance in similar motivational situations. In the retest of the children it was hoped to determine whether answers to the following questions would still show the same trends of effort in the children.

1. Is some motivation more effective than control-motivation for the performance of a task?
2. Does some motivation in addition to success tend to be more effective than success-repetition?
3. Does some motivation in addition to failure tend to be more effective than failure-repetition?
4. Does success-reward tend to be more effective than success-praise?
5. Are failure-reproof and failure-punishment about equal in effectiveness?
6. Is failure-repetition significantly more effective than success-repetition?
7. Is failure-reproof significantly more effective than success-praise?
8. Does failure-punishment tend to be a somewhat more effective motivation than success-reward?

APPARATUS

The apparatus used in this study was the original motivation dynamometer which was devised for and used in the Chase study of motivation. A description together with photographs of the dynamometer are given in the Chase study (2).

The dynamometer was devised to serve two purposes: (1) to enable the experimenter to obtain a record of the amount of force exerted by the child in squeezing the levers, and (2) to control the apparent results of performance seen by the child. A main water system and lever system operated by the child served the first; the secondary water system and the train system operated by the experimenter served the second purpose.

The child squeezed two levers, one of which was movable and the other stationary. The stationary lever, however, was adjustable so that the distance between the hand

grips could be adapted by the experimenter to the size of the child's hand. As the lever moved, it squeezed a rubber bulb in the main system, forcing red colored water through rubber tubes to an upright glass tube on the side of the apparatus visible only to the experimenter. The height of this column of water could be read from a paper meter scale placed behind the tube. By means of a one-way valve which prevented the water from going back through the top of the bulb and by a stopcock which kept it from returning from below the bulb, the liquid was maintained at its highest level while the score was being read. By opening the stopcock, the water column was permitted to flow back out of the glass tube and refill the lower end of the bulb for the next trial.

When it was necessary in the experiment for the child to believe that he was succeeding or that he was failing, he was shown the performance in one of two ways. The first consisted of the water system operated by the experimenter with a rubber bulb concealed beneath the table and an upright glass tube visible to the child and to the experimenter. The second consisted of a train mounted on a movable lever which permitted it to run in an arc along a track. The lengths of the track and the upright glass tube were approximately equal.

Chase used these two methods, the water system for success and the train system for failure, because she believed a change in the appearance of the apparatus would reduce the carry-over from the situation of success to that of failure. When the child was to have no goal and no knowledge of results, as in control-motivation, the train system was removed and the post supporting the two upright glass tubes was covered by a cardboard screen. Under all conditions, the child squeezed the hand levers forcing liquid into the back tube which was always visible to the experimenter.

An adjustable chair and arm rest made it possible to adjust for distance between chair seat and floor, for length of arm from shoulder to elbow, and from elbow to wrist. A strip of soft chamois skin was drawn across the arm and fastened on the outside of the elbow rest to keep the child from lifting his elbow. The arm rest was used only on the right-hand side of the chair in the retest.

An important modification of the apparatus made for the present investigation was the attachment of a heavy coil spring, 1¼ inches long and 3/8 of an inch in diameter, to the movable lever at a point near the fourteenth hole and between the fourteenth hole and a block of wood which acted as a backstop for the lever. This addition was adopted to increase the tension on the levers in order to make the task sufficiently difficult for the oldest children to be tested. The effect of this spring is to increase progressively the difficulty of performance from the easier to the harder holes. When the fulcrum is placed towards the end of the lever nearest the handgrips, the point on the lever where the spring is attached must move through a wider arc. Hence, the spring has greatly increased the difficulty on the hardest holes. When the fulcrum is placed in the holes near the spring, this point on the lever at which the spring is attached moves through a much narrower arc. On the easier holes the difficulty of the task has been affected very little, and the apparatus can still be used to test young preschool children. The change in difficulty from hole to hole, due to the addition of the spring, is registered in the calibration of the apparatus.

A small piece of wood was glued in front of the backstop for the movable lever so that at all times the lever was touching the rubber bulb and was exerting initial tension on the spring.

Since stronger children would be pulling on the movable lever in the retest, it was felt necessary to reinforce the lever in some way. This was done by screwing to the top of the lever a piece of strap iron or sheet metal which had bored in it corresponding fulcrum holes.

The calibration of the dynamometer was done in essentially the same manner as by Chase. In this study two spring balance scales registering in kilograms were arranged to pull horizontally at a certain point on the handgrip of the movable lever. Readings were secured on a given hole when the liquid was at 10, 20, 30, 40, 50, 60, 70, 80, 85, and 90 cm. The fulcrum was moved to each

hole in turn and two sets of readings were secured. During the three weeks when tests were being given in the first part of the week at Ames, Iowa and the last part of the week at Iowa City, Iowa calibrations were secured at the end of each half-week of testing before moving the apparatus to the other city. Calibration was made at the end of each series during the three weeks when all testing was done in Iowa City. At the end of the entire testing period the three sets of paired readings on each hole for the first three weeks in Iowa City were averaged for each 10 cm. of distance for each hole. Likewise, the corresponding three weeks' readings at Ames were combined in one calibration, and those secured during the second three weeks in Iowa City were averaged to make a third calibration. The three sets of calibrations were then called Calibrations I, II, and III respectively. The mean kilogram score for each tenth centimeter for each hole was plotted, and the points for the different centimeter heights were joined by a curve smoothed by inspection. A separate curve was made for each hole used in the tests.

Kilogram values were substituted on the original score sheets by reading the centimeter score and finding its equivalent in kilograms from the curve for the correct hole on the appropriate calibration.

SUBJECTS OF CHASE STUDY AND RETEST

Chase studied originally 213 subjects which she matched for mean age, age range, mean scores, and standard deviations in the control-motivation situation and divided about equally as to numbers in the four respective motivation groups. Of these 213 subjects, 102 were found in the Public Schools of Ames, Iowa and in the University Elementary School, Iowa City, Iowa three years later. They were given retests in all three series of the same motivation group in which they were originally placed by Chase. The scores of these 102 subjects on the original Chase records were sorted out and tabulated. From these tabulations all of the computations and analyses pertinent to the present study made by Chase on the 213 subjects were repeated as though Chase had had only these 102 selected subjects in the first place. The scores and computations on the 102 children are referred to in this report as the "selected Chase subjects." The scores and data obtained in the retest of these same 102 children are called "Smith retest subjects."[1]

Table I shows the mean age and range in age in months according to the sex and motivation groups of the 102 selected Chase subjects. Similar data are also given in the table for the same children when tested by Smith because the differences in means and ranges between the Chase and Smith tests are not quite constant. Chase tested her subjects over a longer period of time than the six weeks used by Smith. Most of the subjects were from thirty-eight to forty months older when given the retest. The ages of the children were calculated to the nearest month as of the day of the test in Series I.

On the Chase tests the mean ages of the four respective groups ranged from 65.66 months in Group C to 68.50 in Group B. A comparison can be made between the 102 selected Chase subjects and the 213 Chase children by referring to Table I in the Chase monograph (2, p. 72). Among those not available for retests were a larger proportion of the younger children. Also, in the selected Chase groups, the boys outnumbered the girls in greater proportions than they did in the larger groups originally tested by Chase.

The general plan of testing was the same as that used in the Chase study except that the perforation test was not given.

A strobophotographic record of the voice in giving instructions in control-motivation and in success-praise, together with an aluminum disc phonograph record of these instructions, is on file at the Iowa Child Welfare Research Station. The strobophotograph gives a diagram of pitch, intensity, and tempo of the voice.

1. The retests were all given by Ruth S. Smith. Harold S. Carlson and La Verne Driver, research assistants at the Iowa Child Welfare Research Station, were the observers.

TABLE I

NUMBER OF CHILDREN, MEAN AND RANGE IN AGE IN MONTHS BY SEX AND MOTIVATION GROUPS IN SERIES I FOR THE 102 SELECTED CHASE SUBJECTS WHO WERE RETESTED BY SMITH AND FOR FORTY-NINE BOYS AND GIRLS TESTED ON THE SAME FULCRUM HOLE OF THE DYNAMOMETER IN ALL SERIES RESPECTIVELY BY CHASE AND BY SMITH

Sex	Children	Selected Chase (Entire Group)		Smith Retest (Entire Group)		Children	Selected Chase (Tested on Same Fulcrum Hole)		Smith Retest (Tested on Same Fulcrum Hole)	
		Age, Months		Age, Months			Age, Months		Age, Months	
		Mean	Range	Mean	Range		Mean	Range	Mean	Range
Group A										
Boys	13	67.3	38 to 83	105.7	76 to 122	10	66.1	38 to 83	104.3	76 to 109
Girls	9	66.2	42 to 92	104.6	80 to 132	3	66.0	55 to 72	103.3	92 to 122
Boys and Girls	22	67.2	38 to 92	105.1	76 to 132	13	66.1	38 to 83	104.1	76 to 122
Group B										
Boys	18	66.6	43 to 94	104.6	81 to 133	9	65.1	45 to 73	102.2	83 to 110
Girls	10	71.9	64 to 96	109.7	101 to 135	6	68.2	64 to 72	104.8	101 to 109
Boys and Girls	28	68.5	43 to 96	106.4	81 to 135	15	66.3	45 to 73	103.2	83 to 110
Group C										
Boys	18	67.5	34 to 92	106.0	84 to 132	5	67.2	62 to 73	104.2	99 to 110
Girls	9	62.0	29 to 73	99.9	68 to 112	4	70.5	64 to 73	107.8	102 to 110
Boys and Girls	27	65.7	29 to 92	104.0	68 to 132	9	68.7	62 to 73	105.7	99 to 110
Group D										
Boys	15	66.2	31 to 79	102.7	70 to 110	7	71.1	63 to 79	106.3	100 to 110
Girls	10	71.1	58 to 95	109.5	97 to 134	5	68.2	63 to 73	106.8	103 to 113
Boys and Girls	25	68.2	31 to 95	105.4	70 to 134	12	69.9	63 to 79	106.5	100 to 113
Combined Groups										
Boys	64	66.8	31 to 94	104.6	70 to 133	31	67.1	38 to 83	104.1	92 to 113
Girls	38	68.0	29 to 96	106.1	68 to 135	18	68.3	55 to 73	105.8	76 to 122
Boys and Girls	102	67.2	29 to 96	105.2	68 to 135	49	67.6	38 to 83	104.7	76 to 122

ANALYSIS OF EXPERIMENTAL RESULTS

Comparison of Selected Chase Subjects With Entire Group

In presenting the experimental findings of this study, a comparison is first made between the 102 selected Chase subjects and the entire Chase group of 213 children.

Table II presents for the 102 selected Chase subjects according to the numbers of children, mean scores, standard deviations, and coefficients of variability together with their respective probable errors. A comparison of these figures, which were computed from the Chase original record blanks, with Table IV of the Chase Monograph (2,p.86) shows that the means and probable errors of the means are practically all higher for the

TABLE II

MEANS IN KILOGRAMS, STANDARD DEVIATIONS OF SCORES AND COEFFICIENTS OF VARIATION BY GROUPS AND SERIES FOR 102 SELECTED CHASE SUBJECTS AND 102 SMITH RETEST SUBJECTS

Group	Children	Mean	Probable Error of Mean	Standard Deviation	Probable Error of Standard Deviation	Coefficients of Variation	Probable Error of Coefficient of Variation
Selected Chase Subjects							
AI	22	7.32	.44	2.96	.30	40.43	3.19
BI	28	6.82	.32	2.54	.23	37.24	3.79
CI	27	7.48	.35	2.73	.25	35.16	3.61
DI	25	7.16	.37	2.77	.26	38.69	4.21
AII	22	6.86	.43	3.02	.31	44.02	5.28
BII	28	8.57	.39	3.05	.28	35.59	3.60
CII	27	9.07	.44	3.34	.31	36.82	3.81
DII	25	9.72	.42	3.09	.30	31.79	3.34
AIII	22	6.09	.40	2.76	.28	45.32	5.48
BIII	28	9.58	.44	3.44	.31	35.91	3.62
CIII	27	10.33	.42	3.21	.30	31.16	3.12
DIII	25	10.40	.50	3.71	.35	35.67	3.81
Smith Retest Subjects							
AI	22	11.90	.55	3.82	.39	32.10	3.59
BI	28	11.04	.32	2.48	.22	22.53	3.15
CI	27	12.88	.47	3.72	.34	28.83	3.41
DI	25	12.88	.46	3.37	.32	26.12	2.66
AII	22	11.27	.59	4.09	.42	36.20	4.16
BII	28	14.04	.42	3.33	.30	23.78	3.09
CII	27	14.19	.62	4.80	.44	33.80	3.44
DII	25	15.36	.53	3.90	.37	25.32	2.54
AIII	22	12.35	.52	3.72	.37	30.26	3.36
BIII	28	15.00	.45	3.56	.32	23.73	3.09
CIII	27	17.19	.47	3.66	.34	21.27	2.03
DIII	25	17.16	.50	3.72	.36	21.62	2.16

selected Chase subjects. No doubt, this is accounted for in part by the fact, mentioned previously, that it was not possible to include in the selected Chase group proportionately as many girls or young children as were included in the entire Chase group. Apart from this difference there are certain similar tendencies observable. The four groups are more comparable with each other in mean scores in Series I. The coefficients of variation, higher in the entire Chase group, are relatively highest for all series in the control Group A both for selected Chase subjects and for the total number of 213 Chase cases. Other group comparisons will be made from subsequent tables.

In Table III is given the reliability of differences of means and standard deviations of groups in Series I, II, and III. The formula used for computing the probable error of the differences is taken from Garrett (3, p. 133):

$$P.E._{(diff.)} = \sqrt{P.E._{(av.\ 1)}^2 + P.E._{(av.\ 2)}^2}$$

These figures for 102 selected Chase subjects are comparable to those given by Chase in Table III (2, pp. 77-78). In Series I, where all children were given control-motivation with no knowledge of results, the groups are comparable, the critical ratios generally being similar or smaller for the

TABLE III

RELIABILITY OF DIFFERENCES OF MEANS AND STANDARD DEVIATIONS OF GROUPS IN SERIES I, II, III, I AND II, II AND III, AND I AND III FOR SELECTED CHASE AND SMITH RETEST SUBJECTS

Group	Comparison of Means			Comparison of Standard Deviations		
	Mean Difference	Probable Error of Difference	Ratio of Difference to Probable Error of Difference	Standard Deviation of Difference	Probable Error of Difference	Ratio of Difference to Probable Error of Difference
Selected Chase Subjects (Entire Group) (102 Children)						
Series I						
AI* and BI	.50	.54	.94	.42	.38	1.11
AI and CI*	.16	.55	.29	.23	.39	.59
AI* and DI	.16	.57	.28	.19	.40	.48
BI and CI*	.66	.48	1.38	.19	.34	.56
BI and DI*	.34	.49	.69	.23	.35	.66
CI* and DI	.32	.51	.63	.04	.36	.11
Series II						
AII and BII*	1.71	.58	2.95	.03	.41	.07
AII and CII*	2.21	.62	3.56	.32	.43	.74
AII and DII*	2.86	.60	4.77	.07	.43	.16
BII and CII*	.50	.59	.85	.29	.41	.71
BII and DII*	1.15	.57	2.02	.04	.41	.10
CII and DII*	.65	.61	1.07	.25	.43	.58
Series III						
AIII and BIII*	3.49	.60	5.92	.68	.42	1.62
AIII and CIII*	4.24	.58	7.43	.45	.41	1.10
AIII and DIII*	4.31	.64	6.73	.95	.45	2.11
BIII and CIII*	.75	.61	1.25	.23	.43	.53
BIII and DIII*	.82	.67	1.22	.27	.46	.57
CIII and DIII*	.07	.653	.11	.50	.46	1.09
Series I and II						
AI* and AII	.46	.17	2.70	.06	.12	.50
BI and BII*	1.75	.26	6.73	.51	.19	2.83
CI and CII*	1.59	.30	5.30	.61	.21	2.90
DI and DII*	2.56	.25	10.24	.32	.18	1.78
Series I and III						
AI* and AIII	1.23	.16	7.69	.20	.11	1.82
BI and BIII*	2.76	.31	9.20	.90	.22	4.09
CI and CIII*	2.83	.19	15.00	.48	.15	3.20
DI and DIII*	3.24	.25	12.96	.94	.18	5.22

(Continued on next page)

*Indicates greater mean.

TABLE III (Continued)

RELIABILITY OF DIFFERENCES OF MEANS AND STANDARD DEVIATIONS OF GROUPS IN SERIES I, II, III, I AND II, II AND III, AND I AND III FOR SELECTED CHASE AND SMITH RETEST SUBJECTS

Group	Comparison of Means			Comparison of Standard Deviations		
	Mean Difference	Probable Error of Difference	Ratio of Difference to Probable Error of Difference	Standard Deviation of Difference	Probable Error of Difference	Ratio of Difference to Probable Error of Difference
Series II and III						
AII* and AIII	.77	.09	8.56	.26	.07	4.33
BII and BIII*	1.01	.23	4.39	.39	.16	2.44
CII and CIII*	1.26	.14	9.00	.13	.10	1.30
DII and DIII*	.68	.21	3.24	.62	.15	4.13
Smith Retest Subjects (Entire Group) (102 Children)						
Series I						
AI* and BI	.87	.63	1.36	1.34	.45	2.98
AI and CI*	.98	.72	1.35	.10	.51	.20
AI* and DI	.98	.71	1.37	.45	.50	.89
BI and CI*	1.84	.57	3.20	1.24	.40	3.06
BI and DI*	1.84	.56	3.32	.89	.39	2.27
CI* and DI	.00	.73	.04	.35	.47	.74
Series II						
AII and BII*	2.76	.73	3.81	.77	.53	1.45
AII and CII*	2.91	.86	3.38	.71	.63	1.12
AII and DII*	4.09	.79	5.12	.20	.57	.34
BII and CII*	.15	.75	.11	1.48	.58	2.54
BI and DII*	1.32	.68	1.95	.57	.51	.89
CII and DII*	1.18	.80	1.46	.90	.62	1.46
Series III						
AIII and BIII*	2.65	.69	3.83	.11	.48	.24
AIII and CIII*	4.84	.71	6.85	.06	.50	.01
AIII and DIII*	4.81	.73	6.63	.01	.51	.02
BIII and CIII*	2.19	.65	3.34	.05	.46	.11
BIII and DIII*	2.16	.68	3.20	.11	.48	.22
CIII and DIII*	.03	.69	.04	.06	.49	.12

(Continued on next page)

*Indicates greater mean.

TABLE III (Continued)

RELIABILITY OF DIFFERENCES OF MEANS AND STANDARD DEVIATIONS OF GROUPS IN SERIES I, II, III, I AND II, II AND III, AND I AND III FOR SELECTED CHASE AND SMITH RETEST SUBJECTS

Group	Comparison of Means			Comparison of Standard Deviations		
	Mean Difference	Probable Error of Difference	Ratio of Difference to Probable Error of Difference	Standard Deviation of Difference	Probable Error of Difference	Ratio of Difference to Probable Error of Difference
Smith Retest Subjects (Entire Group) (102 Children)						
Series I and II						
AI* and AII	.63	.43	1.45	.27	.31	.88
BI and BII*	3.00	.34	8.90	.85	.24	3.56
CI and CII*	1.31	.50	2.61	1.08	.35	3.07
DI and DII*	2.48	.12	20.50	.33	.09	3.88
Series I and III						
AI and AIII*	.45	.29	1.57	.10	.20	.50
BI and BIII*	3.96	.47	8.36	1.08	.34	3.22
CI and CIII*	4.31	.44	9.84	.06	.31	.19
DI and DIII*	4.28	.41	10.36	.37	.29	1.27
Series II and III						
AII and AIII*	1.08	.41	2.60	.37	.29	1.27
BII and BIII*	.26	.31	3.16	.23	.22	1.07
CII and CIII*	3.00	.37	8.20	1.14	.26	4.45
DII and DIII*	1.80	.33	5.54	.18	.23	.79

*Indicates greater mean.

selected Chase subjects than for the entire Chase group. In Series II, Group A, the control group, is significantly different from each of the other groups for the entire number of Chase cases. In the selected cases, however, significance is established between A and D but only approximated as between Group A and the two other groups, there being 97.5 chances in 100 of significance in the case of Group B and 99 chances in 100 of significance in the case of Group C. The lowest critical ratio in both test populations is between Groups B (success-repetition) and C (success-praise), there being only 72 chances in 100 for the selected Chase group as compared with 84 chances in 100 of a true difference in the entire Chase groups. The rank order of critical ratios of differences between means in Series II is identical both for the selected cases and for the entire number. The critical ratios of the differences between standard deviations of the selected Chase cases are noticeably low.

In Series III, where all children except those in the control group had failed to ring the bell, significance of differences is definitely established in both test populations between Group A and the three other respective groups. The group comparisons showing most significant differences among the entire Chase subjects are also

most significant in the selected Chase population.

The following tabulation gives the intercorrelations in terms of the Pearson product moment correlations between series in each of the four groups.[1] These correlations are given for two reasons. In Group A, the control-motivation group, the

Groups	Children	Correlations: Selected Chase	Correlations: Smith Retest
AI and AII	22	.92 ± .02	.71 ± .07
AI and AIII	22	.93 ± .02	.86 ± .04
AII and AIII	22	.98 ± .05	.73 ± .06
BI and BII	28	.75 ± .06	.62 ± .08
BI and BIII	28	.72 ± .06	.28 ± .12
BI and BIII	28	.85 ± .04	.76 ± .03
CI and CII	27	.74 ± .06	.61 ± .08
CI and CIII	27	.89 ± .03	.57 ± .09
CII and CIII	27	.95 ± .05	.81 ± .04
DI and DII	25	.81 ± .05	.98 ± .01
DI and DIII	25	.88 ± .03	.63 ± .08
DII and DIII	25	.91 ± .02	.80 ± .05

correlations are used as one of two methods to establish reliability of the test. Furthermore, the correlations are used in the formula for probable error of the difference between correlated measures. All correlations between series in Group A are high for the selected Chase subjects, though somewhat lower for the Smith retest. The correlation of .28 between control group BI and BIII, failure-repetition of instructions, was largely explained by the scatter diagram which showed two cases of the twenty-eight extremely out of line.

A further comparison is possible between Series I and II, I and III, and II and III for all groups. The reliability of differences between these series is given in Table III. The formula for computing the probable errors of these differences is found in Holzinger (4, p. 243):

$$P.E._{M_1M_2} = \sqrt{(P.E._{M_1})^2 + (P.E._{M_2})^2 - 2r_{12}P.E._{M_1}P.E._{M_2}}$$

The critical ratios of differences to the probable error of the differences between means establish the same respective significant comparisons within the selected Chase subjects as for the entire Chase group (2, p. 78), except that in the selected Chase cases control groups AI and AII are each significantly different from control group AIII.

Result of Retests

Comparisons are made among the groups and series of the same 102 children on their retests a little over three years later. Table II gives again the number of children and the means, standard deviations, and coefficients of variation with their respective probable errors for 102 Smith retest subjects. A consistently lower variability within respective groups of Smith retests may be seen, control Group A being as before more variable in all three series.

Figure 1, on the following page, shows graphically the mean scores and standard deviations of motivation groups by series. The mean score is indicated as the midpoint in the column which gives the range of the standard deviation. A graphic comparison of groups by series is offered in Figure 2, on the following page.

For the retest subjects Table III shows reliability of differences between means and standard deviations of groups in Series I, II, and III. Comparing these children with their scores three years ago one finds essentially the same relationships in Series I and II. In these two series there is a significant difference in the two sets of scores only between control group AII and failure-punishment group DII. In Series III, Groups B, C, and D decreased on the retest the significance of the differences between their responses and those of the children in the control-motivation Group A, although the differences between the mean scores is actually greater this year in favor of failure-reproof and failure-punishment when each is compared with control-motivation. Although differences in response did not reach significance, there was a decided response increase, however, between Group B and Groups C and D respectively in favor of the two latter motivation groups. The increase indicated that children were responding on the retest somewhat more to failure-reproof and failure-

1. Correlations between series for Smith retests are also given in this tabulation.

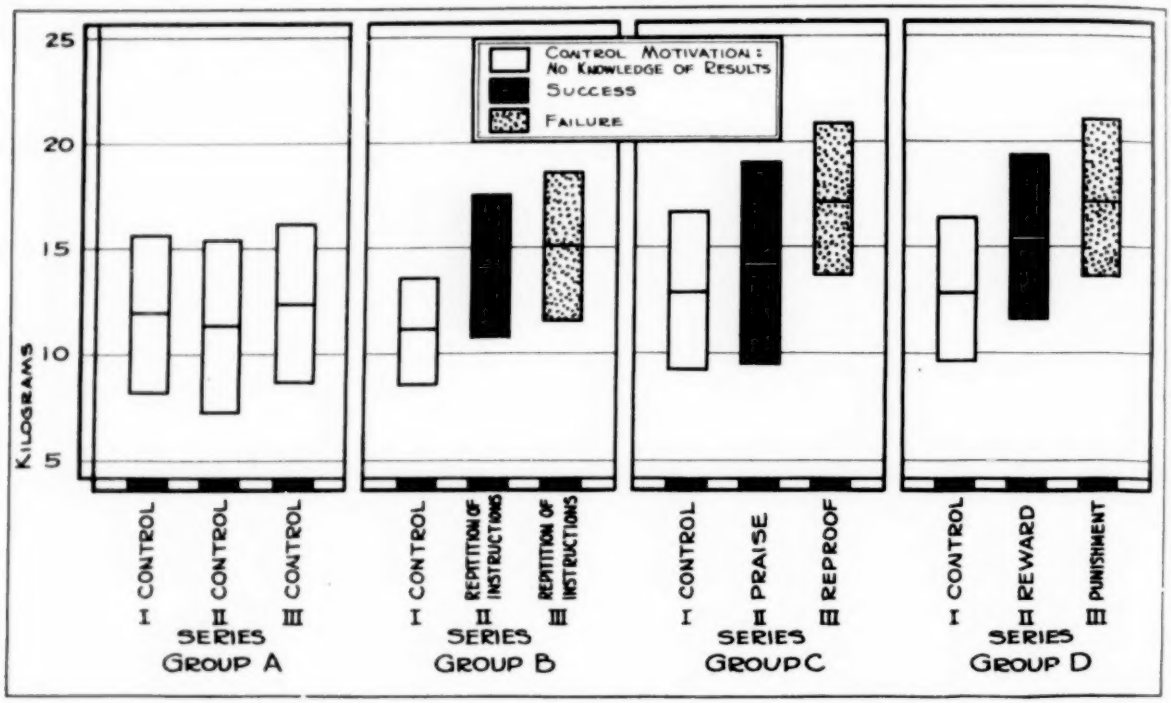


Figure 1

Mean Scores and Standard Deviations of One Hundred Two Smith Retest Subjects for Motivation Groups by Series.

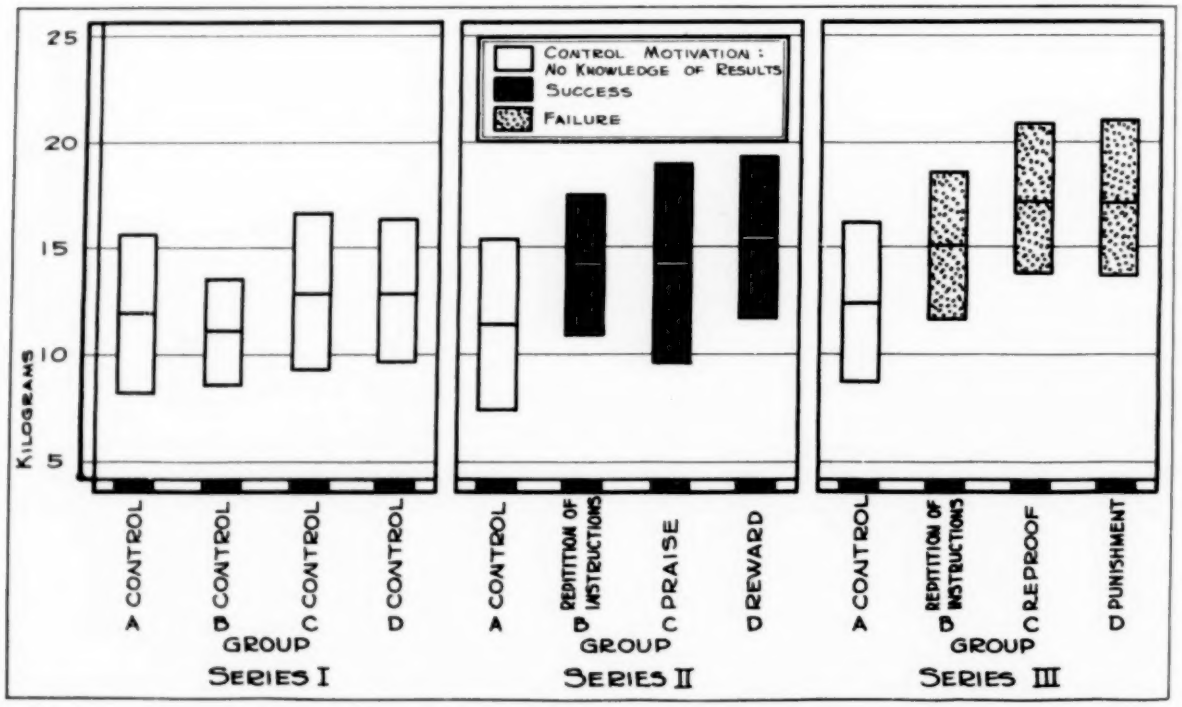


Figure 2

Mean Scores and Standard Deviations of One Hundred Two Smith Retest Subjects for Series by Groups.

punishment as compared with failure-repetition of instruction procedures than they did three years ago. The apparent equality of effectiveness between failure-reproof and failure-punishment is unchanged on the retest.

Table III gives the reliability of the differences of means and standard deviations of responses to motivation in different series. Both this year and three years ago Group B responded significantly more to knowledge of results and success than they did to no knowledge of results, though increasing the critical ratio for this year. On the retest Group C, however, dropped the significant difference established three years ago in favor of success-praise over control-motivation; Group D this year doubled the critical ratio to over 20, raising also the critical ratio for the standard deviation almost to significance.

As between Series I and III on the Chase tests, there was a significant difference within the control-motivation group in the selected Chase subjects, the poorer performance being recorded during the third week. Three years later, however, the advantage swung the other way in favor of Series III. Comparisons of Groups B, C, and D respectively between Series I and III show significant differences in favor of failure on both Chase and Smith tests, with the differences between the means somewhat greater in the retests.

Comparing Series II with Series III, Group A dropped a significant difference in favor of Series II on the Chase test and showed on the retest a difference in favor of Series III approaching significance. There was no change on the retest of relationships between Series II and III for the three other groups established in favor of Series III. Group B, however, dropped an originally significant advantage in favor of Series III failure-repetition of instructions to a difference on the retests that only approached significance, while Group D increased a former advantage to significance on the retest in favor of Series III failure-punishment. No explanation is offered here for the fluctuations of the standard deviations.

Effect of Difficulty of Fulcrum Hole on Child's Performance

During the analysis of the data it was noticed that, where the fulcrum hole had been changed within any series of seven trials, children showed a tendency to raise their scores when given a harder fulcrum hole and to lower them when given an easier hole. This was somewhat to be expected, since the various fulcrum holes were devised to permit children of varying strengths to use the apparatus. It has been presumed that a given child can perform equally well on all fulcrum holes, provided that his centimeter reading in the glass tube is above the initial friction error which appears below the 10 cm. mark. The adjustment of fulcrum holes was made not to increase the amount of effort recorded but to bring the child's reading within the range of the centimeter scale behind the glass tube.

Several additional computations were made to determine whether changes in the fulcrum hole tended to introduce a variability in the score. Data from the selected Chase tests were used. It was found, for example, that among 306 tests there were thirty-nine changes to a harder hole. In twenty-six, or 66.7 per cent of these cases, the score following the change in fulcrum increased over the preceding trial. The mean scores of the thirty-nine trials before and after the change in fulcrum were 10.41 and 11.21 kgs., respectively, with a mean difference of 0.80. There was a correlation of .930 $\pm$ .014 between the respective pairs of trials. Computing the reliability of the difference between means by the formula for correlated measures, a critical ratio of 5.76 was obtained; the ratio indicated that, when the fulcrum was changed to a harder hole in these thirty-nine instances, the mean rise in score of .80 on the succeeding trial was not due to chance. All but eight of these changes were made following the first trial, but since each child's score is given as the mean of the last six trials, the change in fulcrum did not affect the child's mean score for these respective series.

Since most of the changes in fulcrum were made between the first and second trials,

another tabulation was made showing the 271 other scores among the 102 selected Chase subjects where the fulcrum was not changed between the first and second trials. In 211, or 77.9 per cent of these instances, the score on the second trial decreased. The mean scores on the first and second trials for these 271 series of tests were 9.42 and 8.72 kgs. respectively with a mean difference of 0.70 kgs. The correlation between trials was .896 ± .008. Computing again the reliability of the difference between means by the formula for correlated measures, a critical ratio of 10.8 was obtained. This indicates that, when the fulcrum was not changed following the first trial in 271 cases, the decrease in mean scores was not due to chance.

An effort was made to offer some explanation for the relation between the fulcrum hole used and the score obtained by measuring with a pair of steel calipers the distance in millimeters between the handgrips of the apparatus at maximum and minimum distances for respective fulcrum holes. There was found to be a potential range in movement of the handgrip of from 8.9 mm. on hole two to 31.8 mm. on hole twelve. It is probable, however, that no child tested reached either limit. Smith used only holes three to nine. The maximum distance of movement of the movable handgrip is progressively greater from holes two to nine. Both experimenters, however, attempted to adapt to the child's hand the distance between handgrips by adjusting the fixed bar of the apparatus. This adjustment from child to child has in turn upset the systematic relationships of distances between handgrips.

Although there is some evidence that the fulcrum hole used is a factor in the child's score, this study offers no evidence that the influence of the fulcrum is sufficient in amount to disturb either the Chase findings or those of the Smith retest. By inspection of the trials and fulcrum holes used from series to series and group to group, there are no outstanding localized concentrations either on easy or hard holes. There is here no evidence that the fulcrum holes used are not more or less generally distributed.

Results of Tests Not Affected by Fulcrum Hole Influence

Out of the 102 selected Chase children forty-nine were found who were not subject to the influence of the fulcrum hole from series to series. These cases are presented as offering some evidence that where the fulcrum hole error is controlled the relative response to different motivation situations is approximately the same as in the larger groups where the error may be said to be present.

Each of the forty-nine children under consideration was tested by Chase on the same fulcrum hole for each of the three series of weekly tests and by Smith on the same hole for the three series in the retests.

The forty-nine Chase subjects can be compared with the selected Chase groups as to age by referring to Table I which gives the same data for forty-nine children and for the group of 102 children. This further subdivision of subjects cuts down at both ends the general range in age for groups; it disturbs somewhat the relative positions of the mean ages but does not greatly alter their amounts.

Table IV shows the numbers of children by groups and series and the mean scores and standard deviations for the forty-nine selected Chase subjects and for the same forty-nine children on the Smith retest.

The following tabulation contains the intercorrelations between series. These are

Groups	Children	Tested on Same Fulcrum Hole	
		Selected Chase	Smith Retest
AI and AII	13	.91	.96
AI and AIII	13	.93	.96
AII and AIII	13	.96	.99
BI and BII	15	.69	.87
BI and BIII	15	.62	.76
BII and BIII	15	.83	.67
CI and CII	9	.83	.91
CI and CIII	9	.65	.89
CII and CIII	9	.85	.88
DI and DII	12	.94	.92
DI and DIII	12	.79	.75
DII and DIII	12	.75	.89

given in spite of the small numbers because it was felt that the probable error of the differences would be less useful without the correction for correlated measures. It will be noted that, according to the coefficients given for Group A in the control-motivation situations, the test shows a fairly high reliability.

TABLE IV

MEANS IN KILOGRAMS, PROBABLE ERROR OF MEAN, STANDARD DEVIATIONS, AND PROBABLE ERROR OF STANDARD DEVIATION FOR FORTY-NINE SELECTED CHASE AND FORTY-NINE SMITH RETEST SUBJECTS TESTED ON SAME FULCRUM HOLE

Group	Children	Mean	Probable Error of Mean	Standard Deviation	Probable Error of Standard Deviation
Selected Chase Subjects					
AI	13	7.77	.61	3.26	.43
AII	13	7.31	.65	3.49	.46
AIII	13	6.85	.51	2.72	.36
BI	15	6.34	.29	1.60	.20
BII	15	7.14	.29	1.65	.20
BIII	15	7.34	.27	1.54	.19
CI	9	7.56	.29	1.28	.20
CII	9	9.00	.45	2.02	.32
CIII	9	9.67	.38	1.69	.27
DI	12	6.57	.42	2.14	.30
DII	12	8.71	.37	1.90	.26
DIII	12	9.64	.47	2.43	.33
Smith Retest Subjects					
AI	13	12.92	.68	3.65	.48
AII	13	12.77	.60	3.21	.43
AIII	13	13.23	.69	3.68	.49
BI	15	11.74	.39	2.24	.28
BII	15	13.84	.39	2.22	.27
BIII	15	14.34	.42	2.39	.29
CI	9	13.28	.52	2.32	.37
CII	9	14.89	.46	2.05	.33
CIII	9	15.84	.47	2.10	.33
DI	12	13.25	.56	2.85	.39
DII	12	15.63	.74	3.77	.52
DIII	12	15.34	.50	2.58	.36

Table V shows the reliability of the differences between series in comparing the same forty-nine children as tested by Chase and as retested by Smith. The chances in 100 of true differences existing are indicated. The standard deviations have not been compared because of the small number of cases.

Comparison of Five Test Populations

The various responses to different motivation situations have been analyzed for five test populations: (1) the entire Chase group of 213 subjects, (2) the selected Chase group of 102 subjects, (3) the 102 Smith retest cases, (4) the forty-nine Chase subjects, and (5) the forty-nine Smith retest children. Table VI includes a recapitulation of other tables previously given or referred to, indicating critical ratios and larger mean scores in comparisons by groups of Series I and II, I and III, and II and III.

It will be recalled that the groups indicate different types of motivation and that the series indicates the successive weekly tests. Group A received only control motivation, that is, no knowledge of results and repetition of instructions for the three series of successive weekly tests. Control-motivation was also given to each of the other groups in the first weekly tests, namely, BI, CI, and DI. During the second week, Series II, all groups except group A (the control-motivation group) received apparent success and the third week, Series III, they experienced apparent failure. With success accompanying each of the seven trials in Series II, Group B received merely a repetition of instructions, Group C received praise, and Group D a reward. With failure to ring the bell and to make the train go all the way to the station at each of the seven trials, the third week, Series III, Group B received again a repetition of instructions, Group C received reproof for the failure, and Group D was given the punishment described by Chase.

In comparing Series I with Series II, the same trends are shown in all five test populations. In the control-motivation group all the mean scores decreased the second week, though never significantly. In all other groups in all test populations success was more effective than control-motivation, the only differences being indicated by critical ratios of different amounts.

In comparing the 102 selected Chase subjects with their corresponding retests, the group receiving success-praise on the retest showed only 96 chances in 100 of success-praise being more effective than control-motivation, whereas in the original test

TABLE V

RELIABILITY OF DIFFERENCES IN MEAN SCORES FOR GROUPS IN SERIES I AND II, SERIES I AND III, AND SERIES II AND III FOR FORTY-NINE SUBJECTS TESTED ON THE SAME FULCRUM HOLE OF THE DYNAMOMETER IN THE THREE SERIES BY CHASE AND SMITH RESPECTIVELY

Group	Children	Mean Difference	Probable Error of Difference	Ratio of Difference to Probable Error of Difference	Chances In 100 Difference True Difference
Chase Selected Subjects					
Series I and II					
AI* and AII	13	.48	.27	1.79	89
BI and BII*	15	.80	.22	3.59	99
CI and CII*	9	1.44	.27	5.33	Practically Certain
DI and DII*	12	2.14	.14	14.80	Practically Certain
Series I and III					
AI* and AIII	13	.92	.24	3.87	99.5
BI and BIII*	15	1.00	.24	4.20	Practically Certain
CI and CIII*	9	2.11	.29	7.27	Practically Certain
DI and DIII*	12	2.97	.29	10.10	Practically Certain
Series II and III					
AII* and AIII	13	.46	.21	2.15	92
BII and BIII*	15	.20	.16	1.22	79
CII and CIII*	9	.67	.24	2.80	97
DII and DIII*	12	.83	.31	3.64	99
Smith Retest Subjects					
Series I and II					
AI* and AII	13	.15	.21	.73	69
BI and BII*	15	2.10	.20	10.60	Practically Certain
CI and CII*	9	1.61	.19	8.05	Practically Certain
DI and DII*	12	2.33	.31	7.45	Practically Certain
Series I and III					
AI and AIII*	13	.31	.19	1.66	87
BI and BIII*	15	2.60	.28	9.25	Practically Certain
CI and CIII*	9	2.56	.24	10.66	Practically Certain
DI and DIII*	12	2.09	.38	5.50	Practically Certain
Series II and III					
AII and AIII*	13	.46	.11	4.10	Practically Certain
BII and BIII*	15	.50	.33	1.53	85
CII and CIII*	9	.95	.22	4.32	Practically Certain
DII* and DIII	12	.29	.36	.81	71

*Indicates the greater mean.

there was practical certainty of this relationship's not being due to chance.

In comparing the forty-nine Chase and Smith cases with their respective larger groups of 102 from which they have been selected, the changes in the critical ratios are not consistent. To the extent that it shows anything, this would argue against the operation of a systematic fulcrum hole error affecting the relationships of the larger and smaller groups.

When control-motivation the first week is compared with control-motivation the third week for Group A and with failure for each of the other groups, failure in all cases is significantly superior to control-motivation. In the case of Group A the tendency is for the control group to do better the first week on the Chase tests, and to reverse the superiority on the retest. Those reversals are not, however, significant.

There are more variations among the test populations when Series II is compared with Series III. In the control group there is a tendency on the original tests for higher scores to be made the second week than the third. On the retest the tendency is for the control group to make higher scores the third week. Among the five test populations there is a wide variation in the significance of the differences between mean scores for these two control tests. Failure, with but one exception, shows a varying superiority over success, that exception not being significant.

In general, the same trends are shown in the five test populations when series are compared. The chief exception is that on the retest the control group tends to do better the third week.

In Table VI comparisons are made between groups in respective series. The two population groups of forty-nine subjects are omitted because the various fulcrum holes were not used on exactly the same numbers of children from group to group. Table VI shows the larger mean scores and critical ratios of the differences between means in comparison of Groups A, B, C, and D by series.

A glance at the table shows some shifts in larger mean scores between the entire

TABLE VI

RATIOS OF DIFFERENCE TO PROBABLE ERROR OF DIFFERENCE IN COMPARISON OF SERIES I, II, III, I AND II, I AND III, AND OF II AND III BY GROUPS FOR FIVE TEST POPULATIONS

(Second Group in Comparison Having Higher Mean Unless Otherwise Indicated)

Group	Chase (213 Children)	Selected Chase (Entire Group) (102 Children)	Selected Chase (Tested On Same Fulcrum Hole) (49 Children)	Smith Retest (Entire Group) (102 Children)	Smith Retest (Tested On Same Fulcrum Hole) (49 Children)
Series I					
AI and BI	.22*	.94*		1.36*	
AI and CI	1.03	.29		1.35	
AI and DI	.30	.28*		1.37*	
BI and CI	1.34	1.38		3.20	
BI and DI	.57	.69		3.32	
CI and DI	.78*	.63*		.04*	
Series II					
AII and BII	4.58	2.95		3.81	
AII and CII	5.80	3.56		3.38	
AII and DII	7.67	4.77		5.12	
BII and CII	1.48	.85		.11	
BII and DII	3.38	2.02		1.95	
CII and DII	1.82	1.07		1.46	
Series III					
AIII and BIII	6.68	5.92		3.83	
AIII and CIII	8.75	7.43		6.85	
AIII and DIII	7.98	6.73		6.63	
BIII and CIII	2.92	1.25		3.34	
BIII and DIII	2.37	1.22		3.20	
CIII and DIII	.41*	.11		.04	
Series I and II					
AI and AII	1.75*	2.70*	1.79*	1.45*	.73*
BI and BII	10.16	6.73	3.59	8.90	10.60
CI and CII	10.77	5.30	5.33	2.61	8.05
DI and DII	25.37	10.24	14.80	20.50	7.45
Series I and III					
AI and AIII	2.06*	7.69*	3.87*	1.57	1.66
BI and BIII	13.31	9.20	4.20	8.36	9.25
CI and CIII	14.32	15.00	7.27	9.84	10.66
DI and DIII	14.11	12.96	10.10	10.36	5.50
Series II and III					
AII and AIII	.60*	8.56*	2.15*	2.60	4.10
BII and BIII	5.21	4.39	1.22	3.16	1.53
CII and CIII	8.85	9.00	2.80	8.20	4.32*
DII and DIII	2.85	5.24	3.64	5.54	.81*

*Indicates mean for first group in comparison was greater.

Chase group and the selected Chase subjects, all such shifts being accompanied by negligible critical ratios. In Series I, when all groups had control-motivation, there is a surprising agreement between the selected Chase groups and the retest subjects in spite of the fact of irregular differences and very low critical ratios.

In Series II success tends toward a significant difference over control-motivation and achieves significance when accompanied by reward both in the Chase selected cases and in the Smith retests on the same children.

A comparison of the groups in Series III shows that failure is significantly superior to control-motivation in the selected Chase groups. In the retest failure is significantly superior to control-motivation only when accompanied by reproof or punishment, although it shows 99.5 chances in 100 of being significantly greater when accompanied by repetition of instructions. In the retest failure-reproof and failure-punishment show respectively 99.8 and 98.5 chances in 100 of being significantly stronger motivations than success-repetition, the chances being much smaller in the selected Chase groups. No difference is indicated between failure-reproof and failure-punishment in any of the test populations.

In general, the 102 children in the retest responded to the respective motivation situations in very much the same way as they had three years earlier.

For the 102 cases and the forty-nine subjects respectively, Table VII gives the number and per cent of children in the respective groups who decreased their scores 25 per cent or more on the seventh trial as compared with the second trial, who decreased the score on the seventh trial less than 25 per cent, or whose scores on the seventh trial remained the same or increased. Of course, with so few cases separated first into four motivation groups and then subdivided into three other groups, these tables can indicate nothing more than possible tendencies. Table VII shows that on the Chase tests about half or more than half of the subjects tended to fall into the group decreasing their seventh scores by less than 25 per cent; in the Smith tests, however, this proportion approached more nearly three-fourths or over. In Series I for all groups tested by Chase, the children showed a

TABLE VII

PERCENTAGES OF THE 102 SELECTED CHASE AND SMITH RETEST SUBJECTS (ENTIRE GROUP) AND OF THE FORTY-NINE CHASE AND SMITH SUBJECTS (TESTED ON THE SAME FULCRUM HOLE) WHO ON THE LAST TRIAL DECREASED THEIR SCORES 25 PER CENT OR MORE, DECREASED LESS THAN 25 PER CENT AND REMAINED THE SAME, OR INCREASED OVER THE SECOND TRIAL

Series	Decrease 25 Per Cent Or More		Decrease Less Than 25 Per Cent		Scores Remain Same Or Increase		Decrease 25 Per Cent Or More		Decrease Less Than 25 Per Cent		Scores Remain Same Or Increase	
	Children	Per Cent	Children	Per Cent	Children	Per Cent	Children	Per Cent	Children	Per Cent	Children	Per Cent
	Selected Chase (Entire Group)						Smith Retest (Entire Group)					
Group A (22 Subjects)												
I	8	36	11	50	3	4	1	5	16	73	5	23
II	5	23	11	50	6	27	0	0	16	73	6	27
III	5	23	13	59	4	18	1	5	19	86	2	9
Group B (28 Subjects)												
I	10	36	12	43	6	21	3	11	21	75	4	14
II	2	7	21	75	5	18	0	0	24	86	4	14
III	1	4	22	79	5	18	5	18	22	79	1	4
Group C (27 Subjects)												
I	9	33	13	48	5	19	1	4	21	78	5	19
II	1	4	21	78	5	19	1	4	21	78	5	19
III	1	4	18	67	8	30	4	15	21	78	2	7
Group D (28 Subjects)												
I	6	24	16	64	3	12	2	8	22	88	1	4
II	2	8	14	56	9	36	0	0	19	76	6	24
III	1	4	12	48	12	48	7	28	17	68	1	4
	Selected Chase (Tested On Same Fulcrum Hole)						Smith Retest (Tested On Same Fulcrum Hole)					
Group A (13 Subjects)												
I	6	46	7	54	0	0	0	0	12	92	1	8
II	2	15	7	54	4	31	0	0	8	61	5	39
III	4	31	6	46	3	23	1	8	11	84	1	8
Group B (15 Subjects)												
I	8	53	5	34	2	13	2	13	10	67	3	20
II	1	7	12	80	2	13	0	0	14	93	1	7
III	0	0	12	80	3	20	4	26	11	74	0	0
Group C (9 Subjects)												
I	2	22	6	67	1	11	0	0	7	78	2	22
II	1	11	7	78	1	11	1	11	8	89	0	0
III	0	0	7	78	2	22	1	11	8	89	0	0
Group D (12 Subjects)												
I	3	25	8	67	1	8	1	8	10	84	1	8
II	2	17	6	50	4	33	0	0	10	84	2	16
III	0	0	6	50	6	50	4	33	8	67	0	0

disproportionate drop greater than 25 per cent; this is not true of the Smith retests. Table VII was compiled more out of curiosity than expectancy. The cases are so few that the comparison of the forty-nine with the 102 subjects shows merely tendencies that are, in general, similar.

The reliability of the test has been mentioned in referring to the correlations between series in the control-motivation Group A. A further correlation of odd and even scores for forty-nine subjects for Series I, control-motivation, yielded a coefficient of .971 when stepped up once by the Spearman-Brown formula.

QUALITATIVE DATA

Qualitative data were collected on the same blanks (5, pp. 131-133) used by Chase. As in the Chase study, the experimenter's entire attention on the retests had to be given to the administration of the dynamometer test and the recording of the quantitative data. A recorder was present at all tests to observe and record qualitative data. Since Chase made very little of the qualitative data, small hope was held out for doing more here than gathering detailed suggestions for utilizing better this part of the test situation.[1]

Fifty-two subjects were observed simultaneously by two recorders, C and D, in order to determine the reliability of the observer. A coefficient of reliability of .881 was obtained on the fifty-two subjects; a coefficient of reliability of .804 was found on the first twenty-five subjects observed during the first two weeks by the two recorders.

Chase mentions that the dynamometer test is not sufficiently refined to have much diagnostic value. It is possible that this observation is due partly to the inaccuracies of the apparatus itself as pointed out by Chase, and also due in part to the fact that Chase did a considerable amount of smoothing to make calibration curves from which she translated centimeter scores of performance into kilogram readings.

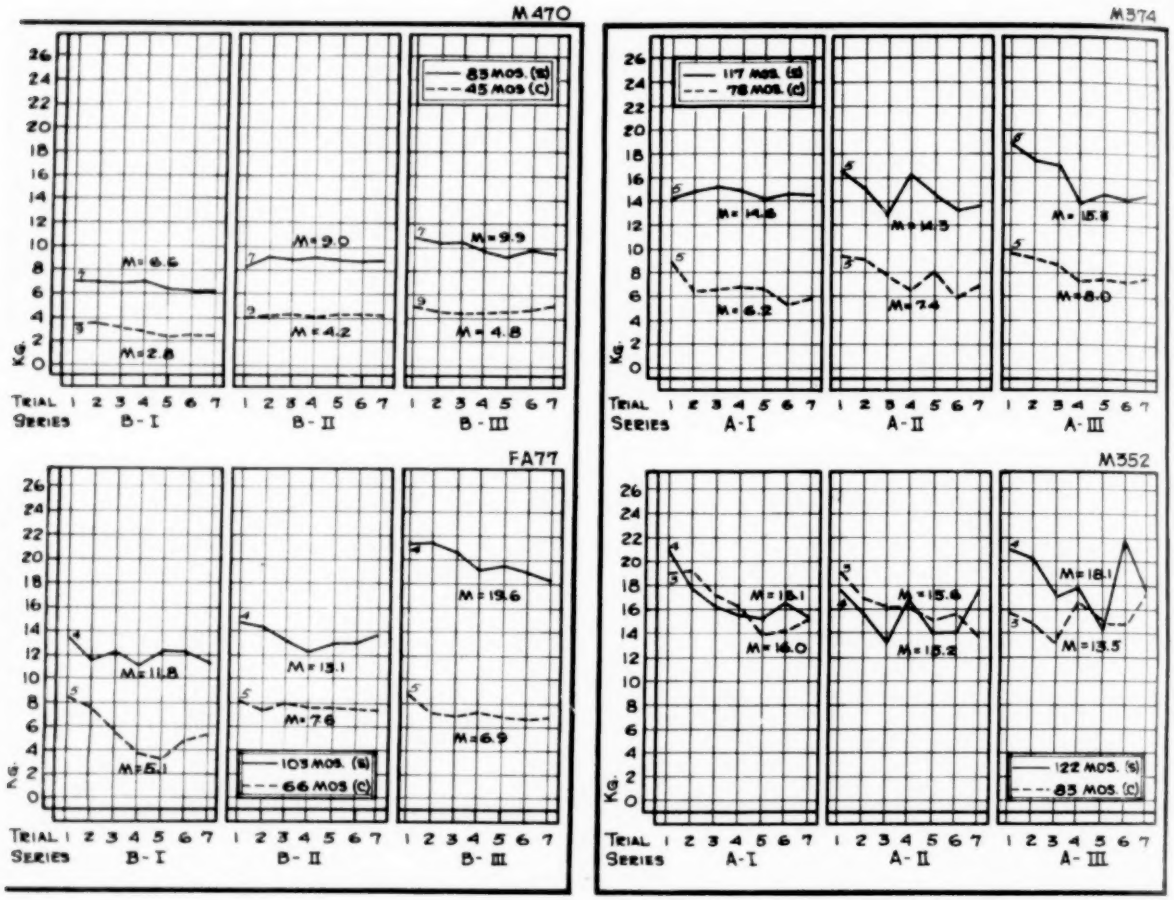
It was hoped in this study to make some attempt to investigate the nature of the responses of individuals to the motivation situations, and to see if some method could be devised to increase the diagnostic value of the Chase experimental technique. As mentioned previously, scores used on the fulcrum holes of the hand dynamometer used by Chase are not comparable to scores on the same holes after the apparatus has been strengthened and made more difficult by Smith for older children. Neither is the relationship from one hole to another known. The Chase technique does not purport to offer a strength test as such.

Where, however, the child has been tested on the same hole in the three respective series, if his response to the motivation situation is the same in the retest as it was three years earlier on the original test, presumably one would obtain similar curves of performance for the seven respective trials in each test in the same series. It is obvious from repeated observations of children in the test situations in various groups that a number of variable factors are still uncontrolled, and that inconsistencies in the curves are not always due to differences in responses to the motivation itself. Checking individual curves with qualitative data obtained by the recorder and with remarks of the child recorded at the time, one finds, for example, that at the time of a particularly low score a child remarks, without himself knowing his score, that his "hand slipped" or that his "hand hurt that time."

A somewhat random sampling of individual curves for three subjects taken from among the four motivation groups of forty-nine children who were tested on the same hole for the last six trials of each of the three series are reproduced in Figures 3 to 9 inclusive.

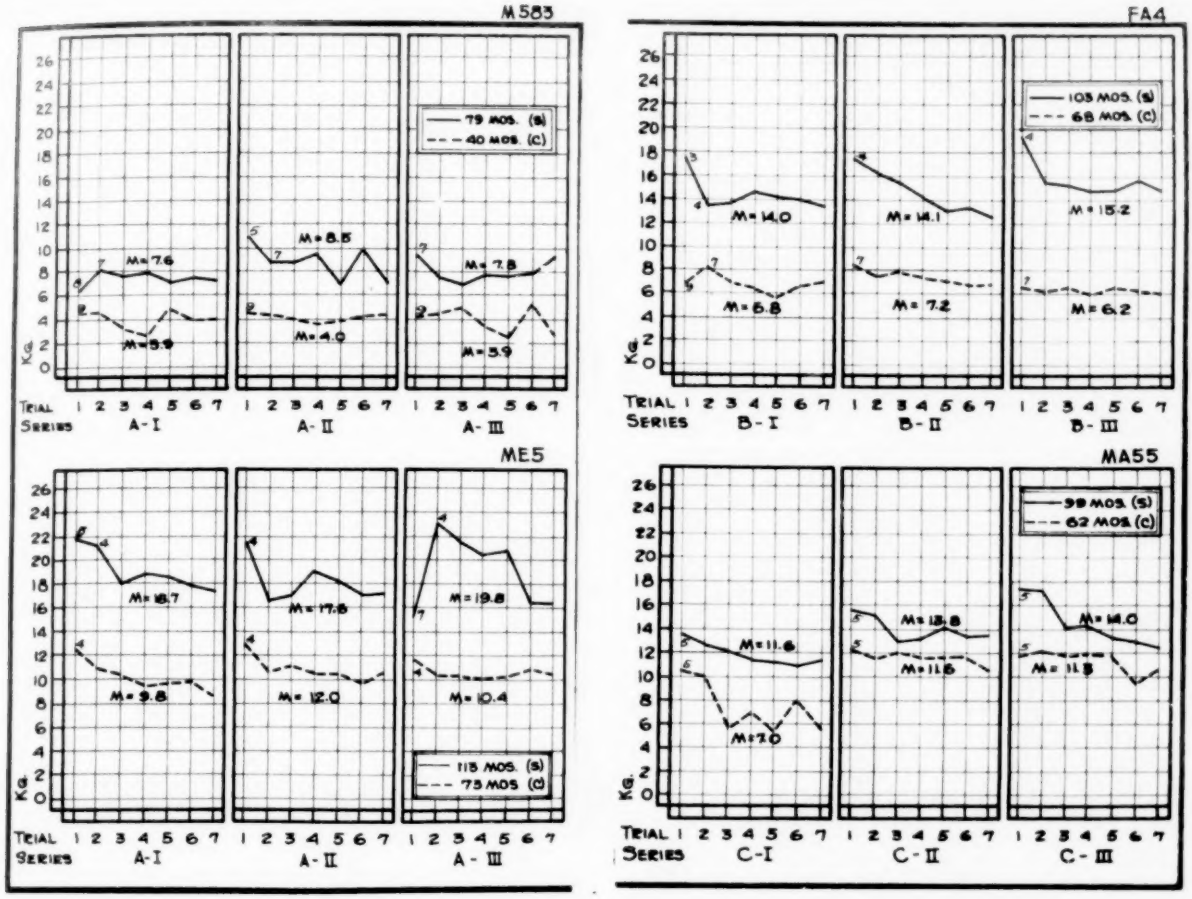
M470 (Figure 3, on the following page), for example, shows little effects of fatigue in all his curves of trials taken when he was forty-five months and eighty-three months old, respectively. In fact the curves are almost a straight, horizontal line. This

1. Detailed suggestions of this sort are included in a supplementary report on the directions for giving the tests, precautions to be observed, and suggestions for improvements in technique of administering the Chase dynamometer test. This report together with other material relating to this investigation will be on file at the Iowa Child Welfare Research Station.



child was tested in Group B and shows a very slight upward progression of his mean scores from Series I to III. The low absolute score, together with the plateau of performance, would suggest that one ought to gather more specific qualitative information about the child at the time the tests are given to determine whether the child could, in fairness, be said to be interested in the test or to be coöperating.

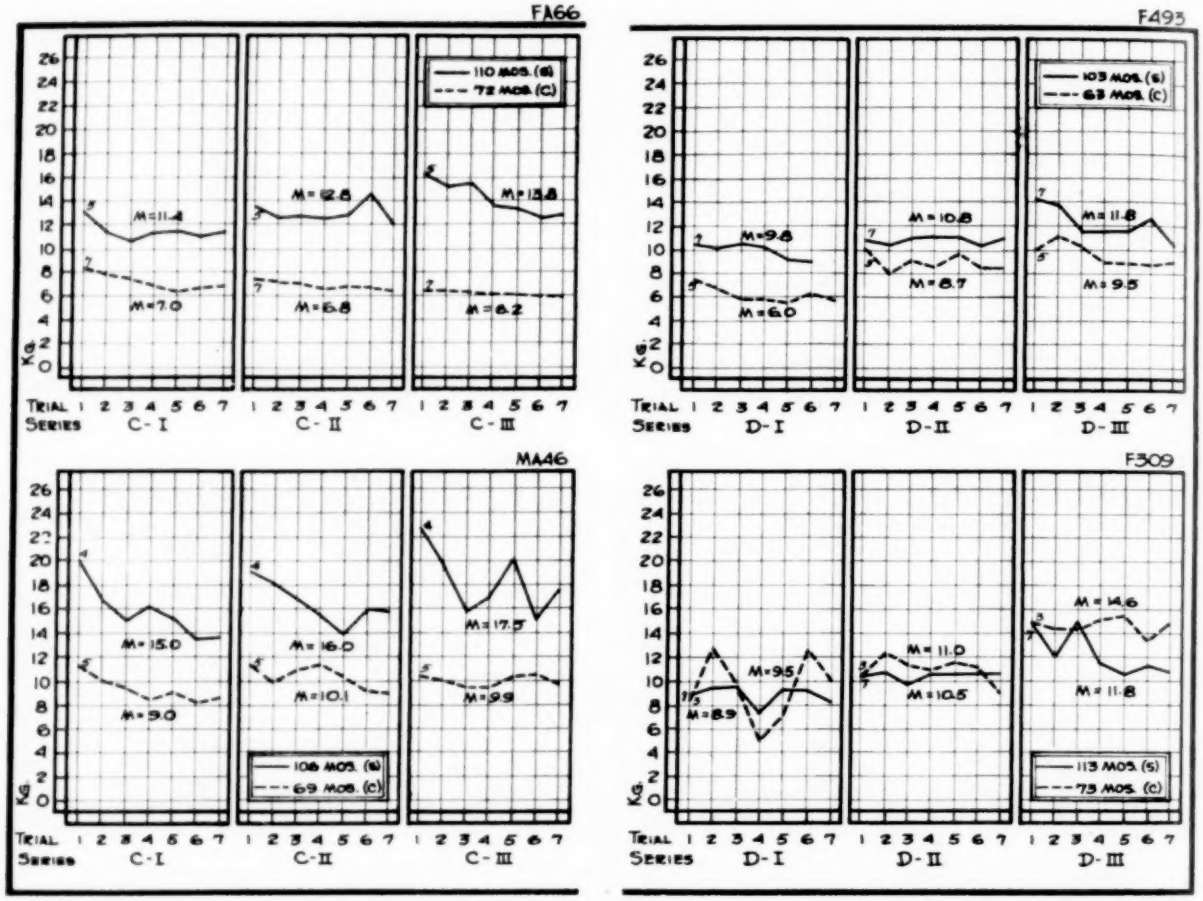
FA4 (Figure 6) shows fairly comparable curves in the respective series of Group B. There are no great differences in mean scores. Both curves in Series I illustrate the tendency of the systematic error due to fulcrum hole changes. The fulcrum holes used in respective trials are indicated in these figures by small numerals near the curves. Where one numeral only is given it means that all seven trials of the series were made on the corresponding hole of that number. Where two numerals are given, one for the first trial and another for the second trial, it means that all trials subsequent to the second trial were taken on the same hole as in the second trial. FA4 had the fulcrums changed after each of the first trials in her tests in Series I. When she was tested by Chase at sixty-eight months of age, the fulcrum was shifted two points to a harder hole and her score on the following trial was greater. Thirty-five months later when she was re'sted by Smith, she was started on a very difficult hole and after the first trial the fulcrum was moved one point to an easier hole. Her score on the succeeding



trial decreased. Several other cases among these figures illustrate the same tendency in the direction of the systematic error. One or two cases, ME5 (Figure 5), for example, show slight score changes not consistent with the systematic error. It must be remembered that the score on the first trial was not counted in computing the child's mean for the series.

It is the opinion of the present experimenters, and the opinion seems to be borne out by the results of the study, that the Chase dynamometer is an apparatus that holds the interest of the oldest children as well as the youngest in the groups tested.

Chase raised the question as to the effectiveness of the punishment, this doubt being shared by the writers at the beginning of this study. The punishment was retained however, to be consistent with the original purpose to make a retest of the children. The writers feel that the raised eyebrows, the puckered mouths, and other behavior of children toward the punishment raise an interesting question as to what it is that constitutes punishment. Perhaps it is not so much that a "gingerbread boy" has been mutilated as the fact that an adult has taken some formal notice of the child's failure that makes the "punished" children respond so highly on the tests and makes their scores equivalent to those in Group CIII who received what might be called another kind of reproof. Similar explanations might be advanced for the effectiveness of gold stars as rewards.



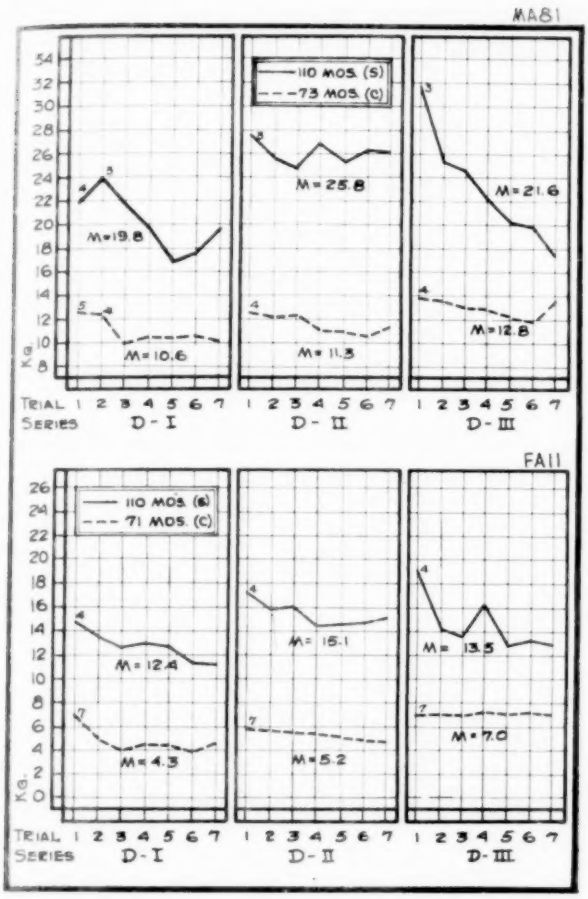
SUMMARY AND CONCLUSIONS

Dr. Chase in 1930 tested on the hand dynamometer devised specially for her study 213 children ranging in age from two to eight years. These subjects, after being given tests of control-motivation, were divided into four motivation groups comparable for mean age, age range, mean scores, and standard deviations.

Three years later an attempt was made in this study to retest as many of her subjects as were available. Each of the 102 children available was retested three times at weekly intervals. Every attempt was made to reproduce as exactly as possible the Chase procedure and technique as far as the test on the hand dynamometer was concerned.

The original Chase data on these 102 children, referred to as the selected Chase subjects, were sorted out and recomputed, comparisons being made on the one hand between these computations and the findings of Chase on the entire group of 213 subjects, and on the other hand between the selected Chase subjects and their respective retests three years later. Eight questions were raised as to the results of the retest which can be answered as follows:

1. Some motivation is more effective than control-motivation. The difference is significant for success-reward, failure-reproof, and failure-punishment; it approaches significance for the three other types of motivation used: success-repetition, success-praise, and failure-repetition. In the



selected Chase group success-repetition and success-praise only approached significance when compared with control-motivation.

2. Some motivation in addition to success tends to be more effective than success-repetition. This tendency is very slight in the case of success-praise for both Chase tests and Smith retests.

3. Some motivation in addition to failure tends to be more effective than telling a child to repeat a performance in which he has just failed. The difference more nearly approaches significance in the retests than in the earlier tests.

4. Success-reward tends to be more effective than success-praise, this tendency showing from 76 to 89 chances in 100 of not being due to chance on both the tests and retests.

5. Failure-reproof and failure-punishment continue to be about equal in effectiveness.

6. Failure-repetition, which on the original tests was significantly more effective than success-repetition, approaches a significant difference on the retest, with 99 chances of the difference not being due to chance.

7. The performance of the subjects was significantly higher when they were reproved for failure than when they were praised for success.

8. Failure-punishment has increased an original tendency toward significance to a significant difference over success-reward.

The above tendencies, with the exceptions noted, are the same as those of the same children on the original tests three years ago.

A systematic variation in scores, due to the fulcrum hole of the apparatus used, was found. There is no evidence that this error is not more or less evenly distributed among groups. At least its absence had no noticeable effects on the tendencies of forty-nine children, for whom the error was not present, to respond to the respective motivations from series to series.

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THE RELIABILITY OF OBSERVATIONS OF TALKATIVENESS AND SOCIAL CONTACT AMONG NURSERY SCHOOL CHILDREN BY THE "SHORT TIME SAMPLE" TECHNIQUE

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The data to be reported in the present paper are subsidiary to a study of the "time-sample" technique in the measurement of emotional expressiveness of nursery school children.[2] The sample consists of fifty children, aged twenty-four to fifty-eight months, in attendance at the nursery school of the Institute of Child Welfare of the University of California. Twenty-five of these children were in attendance during the spring term of 1930 and twenty-five[3] during the spring term of 1932. The mean age of the 1930 sample was 43.0 months and of the 1932 sample, 40.9. The age distribution of the total sample is given below. (Chronological age for the 1930 group is given as of April 1, 1930, and for the 1932 group, April 1, 1932.)

TABLE I

DISTRIBUTION OF CHRONOLOGICAL AGES OF CHILDREN IN THE SAMPLE

Age in Months	No. of Children
23 to 24	1
25 to 26	1
27 to 28	0
29 to 30	1
31 to 32	1
33 to 34	2
35 to 36	8
37 to 38	6
39 to 40	3
41 to 42	6
43 to 44	3
45 to 46	3
47 to 48	5
49 to 50	1
51 to 52	3
53 to 54	3
55 to 56	0
57 to 58	3
Total	50

THE DATA

Each child in the sample was observed, at various times during the day, for a total of twenty days.[4] For each observation day a four-minute record, divided into sixteen quarter-minute sections, is available. The record consists of check-mark notations, made by the observer for each quarter-minute period, of certain features of the child's behavior. One of the features singled out for notation was the child's talking. For each quarter-minute period in which talking occurred, a suitable entry was made on the record form used by the observer; such an entry counts as 1 toward the child's score for "talkativeness." The mean talkativeness score for each child is the number of quarter-minute periods in which talking occurred, divided by the total number of quarter-minute periods in which the child was observed.

1. The staff of the Institute of Child Welfare has coöperated in the criticism of this article. The writers wish particularly to thank Professor Harold E. Jones, Director of Research; Barbara S. Burks; Mary Cover Jones; and Harold D. Carter.

2. The measurement of emotions of nursery school children through time-sample records of facial and vocal expression. MS.

3. Of these, two are included among the twenty-five in attendence during 1930. Elaborate description of the socio-economic status of the sample is not feasible at this time. It may suffice to remark that the clientele of the nursery school is drawn mainly from the upper-middle and professional classes of Berkeley.

4. The twenty days of observation were distributed at random over the school term from February through May. Occasionally, a full twenty days' observations were not available for a child. Every child in the study, however, was observed for at least seventeen four-minute periods (or 272 quarter-minute intervals). For a few cases, because of illness or absence, etc., it was not possible to make each set of four-minute observations on different days. In such instances, the four-minute observation periods were spaced at no less than thirty-minute intervals.

It was possible, usually, for the observer to differentiate between those quarter-minute periods in which the child talked all the time and those in which he talked part of the time. The latter periods contributed not a full 1 but only 1/2 toward the child's score for talkativeness.

Random vocalizing was in the present study counted the same as talking, partly because of its comparatively rare occurrence and partly because it could not always be distinguished with confidence from talking. The following were not included in the child's score for talkativeness: singing, whimpering, whining, screaming, and shouting.

In addition to notations concerning talking, a record was kept of the social activity of each child. Every quarter-minute period of social activity was counted as 1 toward the child's score for "social contact." Following are a few illustrations of the kinds of situation credited toward social contact: a child talking to someone (child or adult),[1] a child making overtures to someone, a child playing as a member of a group game, etc. A child who was merely watching another child, or who was on the outskirts of a group and not a member, or who was playing near but not with another, was not considered to be engaged in social activity. A child's mean social-contact score is the number of quarter-minute observation periods in which social activity occurred, divided by the total number of observation periods.

In further clarification of the nature of the data, it should be stated that all observations were made on the outdoor play yard of the nursery school. No records were taken when the group or any part of the group was engaged in supervised play, a music period, a story period, etc. All the observations in 1932 were made by Observer A; in 1930 about half the observations were made by Observer A and half by Observer B (a graduate student in psychology). Both observers had had considerable preliminary practice, in order to acquire facility in the use of the record form. Each observer was quite familiar to the children, so that she could come fairly close to the child under observation without disturbing his activity or that of his playmates. The correlation between results from the two observers is high enough to justify the use of their observations together without any adjustments or individual analysis (Table III).

RELIABILITY OF THE DATA

Split-Half Reliability

The "split-half" reliability coefficient of the scores for talkativeness was obtained by correlating the mean of each child's scores on all the odd-numbered quarter-minute periods with his mean score on all the even-numbered quarter-minute periods. The "split-half" reliability of the scores for social contact was obtained in a similar way. Results are presented in Table II. It may be noticed that the scores for talkativeness and social contact are both significantly correlated with age (Table VI). Partialing out age, however, still leaves the reliability coefficient of the measurements of talking very close to .95, and the reliability of the measurements of social contact very close to .99 (Table II).

TABLE II

SPLIT-HALF RELIABILITY OF OBSERVATIONS OF TALKATIVENESS AND SOCIAL CONTACT (n = 50)

Variable	Periods	Mean	Median	Standard Deviation	Correlation Coefficient Between Odds and Evens	Spearman-Brown Coefficient	Reliability Coefficient (C.A.Partialed out)*
Talkativeness	Odd	.312	.330	.111	.9401	.9691	.9481
	Even	.319	.330	.123			
Social Contact	Odd	.562	.560	.182	.9886	.9943	.9884
	Even	.560	.547	.184			

*The age-correlations employed in the computation of the partial correlations are given in Table VI.

Agreement Between Two Observers

As a further check on the validity of the data, Observers A and B in 1930 made simultaneous but independent observations of each of thirty children for four minutes per child.[2] A total of four minutes (sixteen consecutive quarter-minute periods) for each child must be admitted to be rather

1. Such a situation is credited both to the child's score for talkativeness and to his score for social contact.
2. The observations were made over a period of three consecutive days in August 1930, twelve children being observed the first day, thirteen the second, and five the third.

brief; the coefficients in Tables II and IV are based on a total of 320 quarter-minute observations, or one and one-third hours of observation for each child, In view of the extreme brevity of the simultaneous observations, the correlations between the scores by each observer are remarkably high, being (with age partialed out) .90 for talkativeness and .95 for social contact (Table III). ods together have been estimated by the Spearman-Brown formula. With age partialed out, these correlations (.82 and .66) are too low for satisfactory reliability. It appears then, that to obtain a stable, representative score for talkativeness and for social contact, the number of observation periods used in the present study would have to be considerably increased.

TABLE III

AGREEMENT BETWEEN TWO OBSERVERS FOR FOUR-MINUTE OBSERVATIONS OF TALKATIVENESS AND SOCIAL CONTACT OF THIRTY CHILDREN

Variable	Observer	Mean	Median	Standard Deviation	Coefficient of Correlation	Correlation with C.A. Partialed Out*
Talkativeness	Observer A	.423	.453	.221	.907	.899
	Observer B	.447	.383	.230		
Social Contact	Observer A	.527	.406	.381	.9496	.9482
	Observer B	.502	.331	.378		

*The age-correlations for the four-minute observations by observer A are .287 and .311 for talkativeness and social contact, respectively; for the observations by observer B, .285 and .241 for talkativeness and social contact, respectively.

Day-to-Day Reliability

Table IV which follows shows for each variable the correlation between (a) the mean of each child's scores on all the odd-numbered days, and (b) his mean score on all the even-numbered days. These correlations (in view of the high coefficients of Tables II and III) may be interpreted as indicating the degree of consistency of the children's responses from odd-day observation periods to even-day periods. The correlations for odd- and even-day peri-

This conclusion may seem at variance with the conclusion implied in the high coefficients of Tables II and III. Tables II and III relate primarily to the accuracy of measurement. With high accuracy of measurement assured, Table IV may be taken to indicate the consistency of the children's actual behavior from one day's observations to another. In Table IV we see clearly that, with age partialed out, the mean of twenty days' observations of four minutes per day will correlate around .80 or less with the mean of twenty other similar days' observations. To obtain a

TABLE IV

DAY-TO-DAY RELIABILITY OF OBSERVATIONS OF TALKATIVENESS AND AND SOCIAL CONTACT (n = 50)

Variable	Days	Mean	Median	Standard Deviation	Correlation Coefficient Between Odds and Evens	Spearman-Brown Coefficient	Coefficient of Correlation (C.A. Partialed Out)*
Talkativeness	Odd	.329	.322	.127	.806	.893	.820
	Even	.304	.305	.115			
Social Contact	Odd	.569	.555	.205	.712	.832	.658
	Even	.551	.528	.197			

*The age-correlations employed in the computation of the partial correlations are given in Table VI.

reliability coefficient of .95 for a constant-age group, it would be necessary (according to the Spearman-Brown formula) to extend the present eighty minutes' observation to about 335 in the case of measurements of talkativeness and to about 790 in the case of measurements of social contact. With age unpartialed, the extension of observations would not have to be so great; a total of about 180 minutes being required in the case of measurements of talkativeness and 310 minutes in the case of measurements of social contact.

CORRELATION BETWEEN MEASUREMENTS OF TALKATIVENESS AND SOCIAL CONTACT

As seen in Table V the raw correlation between the scores for talkativeness and for social contact is .67; with age partialed out, the correlation is only .41. This low correlation may be surprising in view of the fact that most talking occurs in social situations. By no means all the social situations at these preschool levels, however, involve talking.

TABLE V

CORRELATION BETWEEN MEASUREMENTS OF TALKATIVENESS AND SOCIAL CONTACT (n = 50)

Variable	Mean	Median	Standard Deviation	Coefficient of Correlation	Coefficient of Correlation (C.A. Partialed Out)*
Talkativeness	.316	.320	.115	.674	.408
Social Contact	.560	.550	.187		

*The age-correlations employed in the computation of the partial correlation are given in Table VI.

Table VI which follows presents the age correlations used to obtain the partial coefficients in Tables II, IV, and V.

TABLE VI

CORRELATIONS BETWEEN CHRONOLOGICAL AGE* AND SCORES FOR TALKATIVENESS AND SOCIAL CONTACT (n = 50)

Correlation between	Mean	Median	Standard Deviation	Coefficient of correlation
Chronological Age and	41.9	41.2	7.33	....
Talkativeness	.316	.320	.115	.636
Social Contact	.560	.550	.187	.715

*As of April 1, 1930 (1930 sample) or April 1, 1932 (1932 sample).

SUMMARY

1. Sample.--The sample consists of fifty children, aged twenty-four to fifty-eight months, in attendance at the nursery school of the Institute of Child Welfare of the University of California.

2. Data.--(a) For each child, a measure was obtained of the frequency of talking, and the frequency of appearance in a social situation. The measures are derived from observations of each child for twenty days' distributed at random over the school term from February through May. A day's observation of each child lasted four minutes, divided into sixteen quarter-minute periods. The total number of quarter-minute observations available for each child is, therefore, twenty times sixteen, or 320. All observations were made on the outdoor play yard of the nursery school during free-play periods.

(b) In addition to the main observations described in (a) above, two observers made simultaneous but independent observations of each of thirty children for four minutes per child.

3. Findings.--(a) The observations appear to be highly accurate, as judged by split-half reliability coefficients of .95 to .99 (Table II); and by the agreement between two observers (for brief, simultaneous observations) of .90 to .95 (Table III). In calculating these coefficients, age was held constant by partial correlation.

(b) The variation in the children's behavior from time to time on different days appears quite considerable (Table IV). It is estimated that to secure a satisfactorily stable average of the talkativeness of each child, with age held constant, would require about five hours of observation per child, distributed over many days. The corresponding figure for measurements of social contact, with age held constant, is thirteen

hours. With age allowed to vary as in the present sample (Table I), only about three and five hours of observation per child would be necessary for satisfactory measurements of talkativeness and social contact, respectively.

(c) The correlation between scores for talkativeness and social contact with age partialed out is about .40 (Table V). It is suggested that this correlation might be greater in a group of older children.

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The present paper has been restricted chiefly to a study of the reliability of a method. The results indicate clearly that, by the expenditure of a considerable yet reasonable amount of time, good measures can be obtained by the time-sampling technique for at least the great majority of nursery school children. But good measures of what? The clinical psychologist, if given our children's scores for talkativeness or social contact, would immediately demand information concerning the kinds of situations in which the talking occurred; and concerning the various kinds of social activity by which different children may earn identical social-contact scores. These qualitative facts are not yet supplied in any scores compiled by the writers. We think that the qualitative facts are important and ought to be available through adequate, verifiable measures. It seems desirable as a first step, however, to determine the reliability of comparatively easy observations, before proceeding to others which obviously require greater judgment and special skill on the part of the observer. Although the short-sample measures still lack many details of interest to the clinician, they are nevertheless valuable as an initial attack on the problem of securing adequate, verifiable measures of children's behavior in natural, nonlaboratory situations.

THE DEVELOPMENT OF CHILDREN IN THE HOME MANAGEMENT HOUSES OF THE IOWA STATE COLLEGE

by
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and Mechanic Arts

The studies herein reported were undertaken to answer, if possible, some of the questions regarding the development of children in home management houses.

Certain educators have expressed the opinion that the child in the home management house is sure to suffer because of the necessity of adapting himself to so many different people who are only temporarily responsible for his care. The rapidly changing personnel has seemed to the critics the most unfortunate feature of the entire situation. The critics question the ability of the child to develop the necessary feeling of security under such cricumstances. To develop this feeling, there must be someone to act permanently as a parent or as a parent substitute to whom the child may appeal for protection and affection. The inference is that the child has difficulty in finding such a person in the home management house. These criticisms have carried sufficient weight to induce the American Vocational Association to appoint a committee to encourage the study of the problem.

There follows a brief report of what the Home Economics Division of the Iowa State College has done in response to the suggestion of this committee. It will be noted that three investigators, Prall, Simpson, and McLauchlin, each working independently, have approached the problem from somewhat different points of view.

By the very nature of the situation, the number of cases is drastically limited. When Prall began her study there were only three home management house children on the campus, and there never have been more than four at any one time. The series of studies was undertaken with the full realization that no inferences could be drawn regarding home management house children in general. It has been the expectation that other colleges or departments of home economics would carry on similar studies, thus gradually increasing the number of cases to the point where the results would indicate significant trends.

Prall studied the three children who were in the home management houses during the school year of 1928-1929. Her investigations covered a period of approximately eight months. Data regarding the development of the children were secured from the following sources: Diary records were kept by Prall and by the students in the home management houses. Mimeographed daily record sheets were filled out by each child director. A record was made of the appearance of traits in each of the children on Gesell's (3, 4) summaries supplemented by Fenton's (2) findings. Performance tests were given at intervals of approximately two weeks. Physical examinations by the college physician were given at the beginning and at the end of the study. Mental tests (Kuhlmann revision of the Stanford-Binet test and the Merrill-Palmer test) were given at the close of the investigation by the child psychologist. The performance tests consisted of the more objective items in the Gesell summaries and the Kuhlmann test, such as, "opposes thumb in seizing cube", "places cube in cup on command", or "builds tower of three blocks."

During the year 1929-1930, Simpson compared the development of the four home management house children then on the campus with children of the same age from private homes of different socio-economic status. She checked the development of the children against the same summaries that Prall had

used. However, where Gesell and Fenton differed, the Gesell norms were used and the items from Fenton were omitted. In order to avoid ambiguity where a number of people were reporting the appearance of traits, as is the case where the students of the home management house are reporting, some traits were explained more fully by adding or changing a few words. The following are typical of the changes that were made: "sits alone" was changed so that the element of time was more definite and the trait read, "sits alone two minutes" or "sits alone fifteen minutes." "Runs" and "crawls" were changed to "runs across the room" and "crawls a distance of three feet."

Such traits as "vocal expression of feeling of pleasure", "adjusts to simple verbal commissions", "listens with selective interest to familiar words", and "pulls persons to show something of interest" were omitted from the summaries because they appeared to be less objective than the other traits listed. The traits regarding bowel and bladder control were omitted also, not only because of the above reasons but because in cases where the mother made no attempt to train the child it seemed unjust to consider that the child was retarded in his development.

The Gesell summaries were reclassified before they were placed in the hands of the mothers or the resident advisors in the home management houses. The nature of this reclassification may be illustrated as follows: If the child in question was seven months of age, the mother was given a list of traits which included those listed by Gesell at five, six, seven, eight, and nine months. However, the traits were all listed under "seven months level." The fourfold classification was maintained. All of the motor traits for the five months were listed under "motor development", all the language traits under "language", and so on. The mothers and advisors were informed that the child could not be expected to develop all of the traits listed before the investigator made her next call.

For each home management house baby two other children were selected, one from a home where the father was a day laborer and the other from a home where the father was engaged in one of the professions. The mean score of the professional homes on the Chapin (1) scale for rating living room equipment was 26 points higher then the mean score of the nonprofessional homes.

The ages of these children differed by not more than two weeks from that of the home management house child with whom they were being compared. All were given a physical examination by the college physician and were selected in part because they appeared to compare favorably with the home management house children in general health and freedom from serious physical defects. Simpson's study covered a total of twelve children, four home management house children and eight from the homes of the community. Her observations extended through a period of five months.

McLauchlin compared the development of home management house children with children of similar ages in boarding homes and in a children's home, a small orphanage under the management of a religious organization.

Five different boarding homes were selected where six children were available for study throughout the period of the investigation. The children's home used in the study had six children under two years of age. There were six different babies in the four home management houses during the course of her study. Thus, McLauchlin had a total of eighteen children who were observed under the conditions of the investigation. She used the same behavior summaries that were employed by Simpson. She found it impracticable to have physical examinations of the children, but the child psychologist gave them mental tests at the beginning and at the close of the study. Her investigation extended through a period of eight months.

The results, in so far as they could be reduced to quantitative bases, are summarized in Table I on the following page. In comparing the results of the three investigators on the basis of the Gesell summaries, the per cent columns must be used rather than the columns showing the number of children. The latter are not comparable in the three studies because: (1) the children were not identical in age; (2) the actual time spent by the different investigators was not

TABLE I

A COMPARATIVE SUMMARY OF THE HOME MANAGEMENT HOUSE CHILDREN AND THE CONTROL GROUPS IN THE THREE INVESTIGATIONS ON THE GESELL SUMMARIES IN TERMS OF TRAITS DEVELOPED AT OR BEFORE EXPECTED AGE

Groups	Children	Age, Months		Intelligence Quotient		Motor		Language		Adaptive Behavior		Personal-Social Behavior		Total	
		Range	Mean	Range	Mean	Traits	Per Cent	Traits	Per Cent	Traits	Per Cent	Traits	Per Cent	Traits	Per Cent
Prall Home Management	5	5 to 11	7.0	92 to 108	100	91	64.0	50	83.0	60	71.0	62	82.0	263	73.0
Simpson Home Management	4	5 to 17	9.5	94 to 120	104	55	84.6	18	56.2	21	58.3	40	83.3	134	74.0
Professional	4	5 to 17	9.5	110 to 127	118	52	80.0	24	75.0	24	86.8	43	95.7	145	80.0
Nonprofessional	4	5 to 17	9.5	85 to 108	98	49	75.3	19	59.3	24	66.6	35	72.9	127	70.0
McLauchlin Home Management	6	1 to 17	8.4	98 to 133	108	146	77.0	90	80.0	61	78.0	91	80.0	388	78.0
Boarding Homes	6	2 to 19	10.3	74 to 120	95	73	57.0	47	57.0	29	53.0	65	68.0	214	59.0
Institution	6	3 to 17	8.5	65 to 117	88	62	36.0	29	29.0	26	28.0	40	33.0	157	32.0

the same, as has already been indicated; and (3) the summaries themselves underwent some readaptation from one investigation to another.

The table shows that the home management house children had a mean intelligence which placed them as a group in the high normal class; the mean intelligence quotient of the thirteen children was 105. They were superior in this respect to all the children used as controls with the exception of the children of professional fathers in the Simpson study. When arranged according to rank, the order was as follows: professional, home management, nonprofessional, boarding homes, and institutional. The same order obtained for the percentage of traits developed before or at the expected age, as may be seen in the last column.

The home management house children in the Simpson study were superior to both the control groups in the development of motor traits. They also excelled the nonprofessional group in the development of the personal-social trait. They were somewhat inferior, however, to the other two groups in the development of language and adaptive behavior. In every case the differences were so small that little significance may be attached to them. In the McLauchlin investigation the home management house group was superior to each of the control groups in the development of all four types of behavior-motor, language, adaptive, and personal-social. These differences, it would seem, are great enough to be significant. It may be noted that the percentages in the Prall group compared very favorably with the McLauchlin home management house group.

There is the possibility that the reports of the development of the home management house children were more conservative than the reports given by the mothers because of a mother's natural desire for her child to appear as well as possible. The motor traits are the traits which are the most objective, and the investigator could observe practically all of these traits herself. It will be recalled that these are the traits in which the home management house children were the most superior.

An analysis of the investigators' notes gave no evidence that the home management house children suffered emotionally because of their apparently complex social situation. They compared very favorably with the control groups in emotional stability. They were less timid in the presence of strangers. They cried less during the medical examinations. There was less thumb sucking and nail biting among them.

The home management house children were noticeably superior in physical health. No ailments of any kind were registered against them while the investigations were in progress.

The relative high standing of the home management house children in intelligence may possibly be taken as some slight evidence of a superior environment. There can

be no doubt, however, that they represented a superior sampling of illegitimate children. Most of them had been selected from the same home, and the judgment of the superintendent of this home was given much weight in the selection of the children. Furthermore, the mothers were given intelligence tests, and the babies were selected partly on the basis of these scores.

An investigation is now under way to determine the type of adjustment and degree of development that these children have made in their foster homes. There is evidence that the foster homes into which they have gone compare very favorably with foster homes in general.

CONCLUSIONS

Within the limits of these studies, the following conclusions may be reached:

1. The home management children as a group excelled the groups in boarding homes and in the orphanage in every aspect that was studied: intelligence, motor development, language development, adaptive behavior, and personal-social behavior.

2. The home management house children as a group were slightly superior in motor development to the control groups in both the professional and nonprofessional homes.

3. The home management children were slightly superior to the children from the nonprofessional homes in personal-social behavior.

4. The home management house children were somewhat inferior to the children from both the professional and nonprofessional homes in language development and adaptive behavior.

5. The home management house children compared most favorably with all the control groups in physical health and emotional stability.

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SOME PARENT-CHILD RELATIONSHIPS AS SHOWN IN CLINICAL CASE STUDIES

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The ultimate objective of research of which this project is a preliminary step is the determination of the effect of different parent-child relationships on the personality development of the child. According to the original plans for the study, one step was the classification of a series of cases according to the parent-child relationship found in the case. It was suggested that it might be necessary to devise a scale similar to Wickman's (15) scale for rating children's behavior so that cases could be classified according to different degrees of parent-child relationship. The need for an objective means whereby two persons could classify cases with a fair degree of agreement was felt to be an essential preliminary for research in this field.

Because of the need for this scale, the purpose of this research was twofold: (1) to develop a technique for the classification of cases according to the parent's emotional attitude towards his child, and (2) to classify approximately 100 cases by means of the technique developed. A comparative study was made of the age, sex, and problems of the children whose cases fall in the various categories according to the parent's attitudes. The technique devised, A Guide For the Estimation of Parental Attitudes on Case Data,[1] is printed in connection with this article. The second part of the research, as here reported, aimed to discover any association which might exist between children's problems and different attitudes as determined by the use of the guide.

DEFINITION OF TERMS

Attitude

The definition of "attitude" by Thurstone (11) gives precisely the meaning of the term as used in this study:

> "....the degree of affect about a psychological object. Affect has two directions in its primitive sense, appetition and aversion. It is here used to designate potential action which is favorable toward a psychological object or unfavorable and against it. The strength of this affect which may be positive or negative is the trait measured by the attitude scale."

The psychological object in this case is the child. The affect is the feeling of a parent which leads him to approach or withdraw from the child; it is used to designate potential action in the direction of close association with the child or in the opposite direction of actual or psychological separation from him. A relationship which results from a tendency towards close association is often referred to as an attachment. A relationship which results from a tendency to withdraw from or to repel the child so as to produce separation is often referred to as a rejection of the child. One which vacillates between the former and the latter is spoken of as an ambivalent relationship. The strength of the feeling, which may be positive or negative, is the trait which is estimated and classified by the guide.

A special type of attitude frequently seen in clinical cases is spoken of as an overprotective attitude or as a case of overprotection of the child by the parent. The name contains the key to its chief characteristic. The parent is overanxious concerning the welfare of the child, overzealous in caring for him, and protects him from what he considers harmful to a degree not warranted by the conditions. The parent may also be oversolicitous in seeking to please the child. One type of overprotection is thought to be an indication of a negative attitude of which the parent is

1. Details of the construction and validation of the guide are reported in a separate article which has been published by the author.

ashamed. The parent, generally the mother, may or may not be aware of an impulse to reject the child, but because this impulse does not meet with social approval she exaggerates the performance of her duty of being a good mother to prove, perhaps even to herself, that she has no wish to put psychological distance between herself and the child.[1] The negative character of the relationship is often noted in a lack of demonstrativeness of the parent toward the child, in nagging, or in actions of the parent who in a nice way is "forever at a child." Whether an overprotective attitude is really a positive attitude and the parent is overprotective because of genuine devotion and high evaluation of the child or whether it appears to be positive except for certain indications of friction and antagonism which point to a negative attitude is vital in the study of the etiology of behavior problems in children. In this study, overprotection is used to refer to the type of attitude which might be described as disguised rejection.

It is assumed that attitudes are built up through the influence of life experiences upon the native equipment of the parent, so that there is multiple causation of the attitude or relationship in question. Early experiences which influence personality development, the example set by their parents, the feeling for the other parent, for other children, the behavior of the child in question, are all factors which influence the fundamental feeling which is spoken of as attitude.

Some parents accept the teachings of their parents, their church, philosophers, teachers, or other agencies which set up cultural patterns; others reject some of these to take up new patterns, new ideas, new principles, frequently the opposite of the traditional customs. Just what force determines which patterns a parent will accept for the guidance of his child cannot be decided in the present study. Whether or not the parent's emotional attitude towards the child determines what cultural patterns, teachings, or practices he uses should be a topic for further research. Whatever it is that influences a parent to bind his child closely to him, to keep the child at a distance with an antagonistic relationship, or to maintain a fine balance between the two extremes could not be determined in this project.

Parent-Child Relationship

The term "relationship" is defined by Fowler and Fowler (3) as "tie of kindred, degree of propinquity of this." The purpose of this research is to define varying degrees of propinquity between parent and child and to estimate the strength of the tie between them. The term relationship is broader than attitude, as it includes the parent's attitude towards the child, the child's attitude towards the parent, and the action and reaction of each to the other. The emphasis is on the parent side of the relationship. The child's behavior as a possible cause of the parent's attitude is not in the focus of attention in the construction of the guide, but is studied in the second part of this project.

Since the ultimate objective of this type of research is the knowledge of the effect of different parental attitudes upon the child's personality development, the significant factor is the effect, not the cause, of the parent's behavior towards the child. It is recognized that what is thought of as an effect in one generation may be a cause in the next. This point of view is well stated by Lowrey (5):

> "To begin with, it is necessary to remember that the adult is the product of all that has gone before--native constitution as modified by the incidents, accidents, and experiences of existence. Important among these influences are the early childhood experiences..... Especially significant are the early emotional bonds with the parents, and the fruits of this experience are extremely important in the later relationships. Too close a relationship between parent and child--the "fixation" situation--may interfere with a satisfactory adjustment to the mate or to children. Rejection by the parent may lead to overvaluation and overprotection of offspring. Frustrations of any sort in reaching valued competitive goals

1. An example of an overprotective attitude will be found in the account of the mother's behavior in Chapter III of Zachry (16).

> may be the cause of unwholesome attitude toward the children, such as overprotection, spoiling, too high standards, too much strictness, rejection. Outstanding here is the failure to achieve needed satisfactions from the mate, whatever the source of failure may be."

Behavior

The term "behavior" is used to designate observable actions, including verbalizations of feelings and opinions and interpretations of them by the subject whose behavior is being studied. The term is used here to refer to the actions of the parent in handling the child and in assuming responsibility for him, including statements of his feeling towards the child, statements about the child which indicate his reaction to him, and his interpretation of his own behavior.

CONSTRUCTION AND EVALUATION OF THE GUIDE

The guide was set up in accordance with the consensus of opinion of forty-one child guidance clinicians as to the positive or negative parental attitude indicated in the general statements of parental behavior of which the guide is composed. The writer read twenty-one cases covering a wide range of problem behavior in children and selected from them every statement which referred to the parent's reaction to the child. Five hundred eighty-nine such selections were grouped, according to similarity in the parent's behavior, under ninety-two general statements describing types of behavior. Thirty-nine of these general statements referred to the amount of responsibility which the parent took for the child, and sixteen referred to the parent's method of handling the child and his way of reacting to the child's behavior.

These fifty-five statements with illustrative examples from the cases were printed on cards sent to twenty-five child guidance clinics to be sorted by a psychiatrist, a psychologist, and a psychiatric social worker in each according to the degree of attachment of parent to child indicated in the general statements. There were nine categories ranging from 4+ to 4-, with zero for those statements which gave no indications of the emotional tie between parent and child. The clinicians were asked to evaluate the general statements, not the examples, and also to take the behavior under consideration at its face value.

In order to find a group of statements which could be used as key points in the identification of the special attitude overprotection, thirty-seven additional statements which referred more directly to the parent's feeling towards the child or the child's reaction to the parent were also sent out to be rated as to whether they always showed an affectionate bond between parent and child or the opposite. Here again the zero category was reserved for those statements which might show either attitude or neither. Forty-one of the forty-six ratings returned were summarized and items rejected when the percentage of clinicians agreeing did not meet the criterion set (any percentage which would be greater than 50 per cent plus three times its probable error). When a sufficient number of clinicians had agreed in rating an item other than the key points as positive or negative, that item was then placed in the category from 4+ to 4- in which the mid-score of all the positive or negative ratings of the items fell. The guide as it was constructed and used in this study is presented with the realization that it is still in an experimental form and needs further refinement.

Not all the behavior of the parents recorded can be considered an indication of the emotional relationship between parent and child. If a father does not provide financial support for his child because he is disabled, this single item is of no significance in determining the parent's attitude towards the child. But if the case material shows that he is able to support the child and does not and if this seems, to the person charting the case, to be an indication of a lack of affection between parent and child, this item would be counted in the final estimation of attitude. Behavior which is the result of inevitable limitations of the environment (economic, hygienic, and vocational) cannot be used in forming an opinion as to the feeling towards the child. No item is evaluated in isolation, but is to be weighed in the light of all the material in the case and

omitted or placed in its proper category in the chart accordingly.

When all the parental behavior has been charted according to this scheme, the final classification given to the case is determined according to the directions for the final estimate. The guide, with directions for its use, is to be found following this article.

In order to determine the degree of agreement between two trained workers using the guide, sixty-five cases were read, charted, and classified by the writer and another psychiatric social worker. After a preliminary practice of seventeen cases, the workers at no time conferred on the analysis of the forty-eight cases on which the estimate of reliability was made. Because of the non-numerical character of the data, the ninety-six ratings were treated as attributes and the coefficient of mean square contingency was used. This was found to be .80. This surprisingly high degree of agreement may be due to the similarity in training of the two raters. This should not reduce the value of the guide, as it is designed for use by trained workers.

Thirty-one of the same forty-eight cases were used in the study of the validity. These cases contained statements in the report of the staff conference concerning the parent's attitude towards the child. The statements were collected by the writer and submitted to a third worker who rated them. The second worker refrained from looking at the staff report as she was reading these cases. Her rating was correlated with that of the third worker by the mean square contingency method. There were forty-one of these ratings, as ten of the cases had quotations from the staff report concerning both parents. The C was found to be .54.

The interpretation of this coefficient is difficult because of possible conflicting factors influencing it. The roughness of the classification of attitudes would probably tend to raise it. On the other hand, the fact that in only two instances did the third worker use the ambivalent category and that in no case did she use the zero or over-protective categories caused a scattering in the contingency table, reducing it to a three by five table. This would tend to lower the C. In using quotations from a staff conference which were not designed to evaluate the parental attitude and in basing an estimate on such brief excerpts, errors are bound to creep in. Forty-one cases is a small number for this purpose. With a larger number of cases, a more uniform use of all the categories, and ratings of three clinicians or more on a random sample of cases, the coefficient would be a better measure than the present one. However, it is reported as the result obtained by the only method available for the estimation of validity in this study.

POPULATION STUDIED

During the five-year demonstration program of the Commonwealth Fund, about 3,000 child guidance case records were assembled by the Division on the Prevention of Delinquency (now the Division on Community Clinics) of the National Committee for Mental Hygiene.[1] These constitute a confidential case library chiefly for research purposes. The cases in this study were selected from the "full service clinic staff cases" of three closed demonstration child guidance clinics which will be referred to as Clinics A, B, and C. Each was located in a large city, Clinic A in the central portion of the United States, Clinic B on the Atlantic seaboard, and Clinic C on the west coast. The use of standardized forms and outlines has made possible the comparison of data from these three clinics.[2] As full service clinic staff cases, each of the children was subjected to a fourfold study which included a physical examination, a psychiatric and psychological examination, and a social study. This type of case will be referred to henceforth as a full-study case.

SELECTIVE CRITERIA

In setting up the criteria for the actual selection of cases, four factors which might be major causes of atypical behavior were eliminated: extremes of intelligence, gross physical defects, broken homes, and unsatisfactory economic status of family.

1. Clark (1) gives a brief history of the program.
2. The fourfold study is outlined in the Appendix of Lee and Kenworthy (4). Examples of fourfold study case records will be found in Zachry (16) and in Watson (13).

Since the broken home is frequently referred to as a major factor in the causation of delinquency, it was decided to select only cases in which both parents were living in the home. This, of course, does not eliminate marital disharmony as a factor in the etiology of the problems in the cases studied. The selection of cases in which the economic status was comfortable or affluent should eliminate economic stress as a major cause of the problem behavior. It is still possible that friction in the home may be the result of conflict over economic status even though it be comfortable.

Subnormal intelligence in children may so easily be an irritant to the family relationships, as well as being a primary cause of school failure with its train of unsatisfying experiences for the child, that all cases below 85 I.Q. as determined by the Stanford-Binet test were eliminated. The original plan was to eliminate all cases with I.Q.'s over 115 as well, since superior intelligence may cause problems in a child's social adjustment. When it was found, however, that only fifty-five of the 574 full-study cases met this as well as the other three criteria, the upper limit was abolished.

This criterion does not entirely exclude low intelligence as a cause of behavior difficulties. A detailed analysis of each case record would be the only adequate method for this purpose, as the significant factor in many cases is not the actual I.Q. of the child, but the relationship of the intelligence level of the patient to that of the siblings and the parents. A child with an I.Q. of 100 who has a sibling competitor whose level is 130 or thereabouts may develop feelings of inferiority or inadequacy even more readily than a child of 70 I.Q. competing with a sibling of average intelligence. The emotional reaction of the parents to the two children in either case may be similarly affected by the difference in the children's ability.

Finally, records containing the report of a gross physical defect were discarded in order to remove from the group cases in which feelings of inferiority might be caused by a physical defect. This does not insure the elimination of all cases in which a child may magnify a simple defect or may imagine that he has a disease which is not found present upon examination.

Although it is impossible completely to eliminate marital disharmony, low intelligence, physical defects, and emotional strain due to conflict over economic conditions as etiological factors without a detailed analysis of each case record, still it was felt that by the use of the four criteria a group would be selected in which there would be less chance that these factors were major causes of the behavior problems than if cases involving step-parents, economic dependency, feeble-mindedness, deafness, blindness, and other gross defects were included.

METHOD OF SELECTION

Procedure

The selection of cases was facilitated by the use of the statistical cards on file in the New York office of the National Committee for Mental Hygiene. These cards contain information summarized from the case records in the library of cases. The summary cards of the full-study cases of demonstration child guidance clinics A, B, and C were inspected to select the cases in which both parents were living in the home at the time the child was referred to the clinic. In cases fulfilling this condition, the cards on which the economic status of the family was listed as comfortable or affluent were retained. Of these, the cases in which the I.Q. was listed as over 85 were drawn out. Finally, these were sorted according to the listing of physical defects.

Difficulties Encountered

No difficulty was encountered in selecting the cases according to any of the criteria except that of choosing cases in which no gross physical defect was listed in the report of the findings of the physical examination. Cases in which "the examination was negative", in which the findings were "dental caries", and in which the recommendations advised "dental care, general hygiene for rest and undernourishment, attention to diet and rest", "posture exercises", and "sex instruction" were accepted from the data on the summary card. Cases in which a deformity or a cardiac involvement

was mentioned, cases of glandular imbalance and post-encephalitis and cases in which an immediate tonsilectomy was advised were discarded with one or two exceptions. If there were no special recommendations in the complete report of the physical examination and if the staff conference report did not indicate that the physical condition contributed to the child's problem, the case was selected for study. If additional special examinations gave any indication that the physical condition was a significant cause, the case was omitted.

Exceptional Cases

Four cases were included which would have been omitted except that the report of the staff conference contained statements concerning the parent-child relationship which made it possible to use the case in the study of the validity of the guide. Since the discarding of these cases would have reduced the number which could be used for this purpose to twenty-seven, an exception was made to the standards of selection set up for the remainder of the cases. In one of the exceptional cases, the child was given thyroid medication; in a second, the movement of the child's elbow was slightly impaired; in the third case, the child had a visual defect which "may have affected his reading"; and in a fourth, the child was 16 per cent underweight. No other cases were included in which the child's physical condition was reported to be a cause of his problem.

Summary of Physical Findings in Selected Cases

Negative findings and no recommendations for follow-up treatment were found in only seven of the ninety physical examinations reported for the cases chosen for study.[1] Special nose and throat examinations and attention to diet and rest were each recommended for twenty-five cases. The next most frequent recommendation was for dental care. This occurred twenty-one times. An eye examination appeared fifteen times and an ear examination, six. Posture training or exercise was recommended in twelve cases. A Wassermann test, the only other recommendation occurring more than five times, appeared in six cases.

COMPARISON OF SELECTED CASES WITH CLINIC POPULATION

Cases Used as a Basis for Comparison

The writer was given the privilege of using statistical data on 1,195 cases from Clinics A, B, and C which were studied for a report of the demonstration child guidance clinics.[2] These statistics have made it possible to compare the group of cases selected for this study with a large number of cases drawn from the same clinics. The latter will be referred to as studied cases and include those which were given the various types of treatment services used in the demonstration clinics. The cases included in the present study were selected from the full-study cases, of which there was a total of 574 from the three clinics in the confidential library of cases in the National Committee for Mental Hygiene.

Incidence of Selected Cases

One-sixth of the full-study cases from the clinics met the criteria for the selection of cases. The following tabulation (Table I) shows that the full-study cases were about 50 per cent of the studied cases in each of the three clinics, so that the criteria functioned on very nearly the same percentage of cases from each clinic.

TABLE I

THE NUMBER AND PERCENTAGE OF CASES CONTRIBUTED BY EACH CLINIC

	Cases in Group			Per Cent		
Clinic	Studied*	Full-Study	Selected	Studied	Full-Study	Selected
A	533	222	40	45	39	42
B	362	186	26	30	32	28
C	300	168	28	25	29	30
Total	1195	574	94	100	100	100

*Studied cases are those reported in Dr. Stevenson's manuscript.

1. In four cases there was no detailed report of the findings as the physical examination was made by a private physician.
2. From the unpublished manuscript by Dr. George S. Stevenson.

This tabulation indicates that each clinic contributed a practically constant percentage of cases to each of the groups under consideration. Since from each clinic the criteria selected about 16 per cent of the cases, it is probable that the population of the three clinics was similar in its constituents.

Comparison as to Intelligence Quotients

TABLE II

THE COMPARISON OF THE TWO GROUPS OF CASES ACCORDING TO I.Q.

Intelligence Quotient	Cases		Per Cent	
	Selected Group	Studied Group	Selected Group	Studied Group
Not reported	4	48	4	4
Below 70	0	72	0	6
70 to 79	0	136	0	11
80 to 89	1	232	1	20
90 to 109	39	471	41	39
110 to 119	24	122	26	10
120 or over	26	114	28	10
Total	94	1195	100	100

TABLE III

THE DISTRIBUTION OF CASES WITH I.Q.'S OVER 120

Intelligence Quotient	Selected Group Cases Per Cent	
120 to 129	16	18
130 to 139	4	4
140 to 149	3	3
150 to 159	2	2
160 to 169	0	0
170 to 179	1	1

The comparison of the two groups of cases according to I.Q. is given in Tables II and III. About 40 per cent of both groups of cases have I.Q.'s between 90 and 110. The criteria have selected the same percentage of cases of average intelligence as are found in the total clinic population. The distribution of cases with I.Q.'s over 120 is given for the selected group but could not be given for the studied cases of the total clinic population, since specific information was not available. In two cases, the Stanford-Binet examination was incomplete due to lack of coöperation; one child was judged to be "normal", the other "low average." Two patients were found to be of normal intelligence according to the Army Alpha test.

Terman (10, p. 94) stated that "about 60 per cent of all school children test between 90 and 110 I.Q." He refers to this group as having "normal, or average intelligence." Both the selected group and the studied group contain about two-thirds as many children of average intelligence as an unselected group of school children according to Terman's figures. Terman found that 1 per cent of unselected school children tested below 70 I.Q. and fell in the definitely feeble-minded group. In the studied cases, 6 per cent fell in this feeble-minded group. Thirty-seven per cent of the cases had I.Q.'s lower than 90 in contrast to 20 per cent of Terman's unselected school children who had I.Q.'s of 91 or less. In both Terman's group and the studied group 20 per cent reached or exceeded an I.Q. of 110.

It is to be expected, perhaps, that the percentage of subnormal children in the total clinic population as represented by the studied cases of the three clinics would be greater than that percentage in a group of unselected school children. However, the fact that there is exactly the same percentage of superior children in the clinic group as in the unselected group and two-thirds as many children of average intelligence in this group as in the unselected group may be a surprise to persons who are unfamiliar with clinic groups. The majority of the 1,195 children in the clinic group are of average or superior intelligence. This point should be emphasized to help remove the stigma which is sometimes attached to child guidance clinics due to the mistaken idea that their function is to serve the subnormal child.

While the four factors operative in the selection of cases to be included in this study have drawn from the clinic population the same percentage of children of average intelligence, they have singled out two and one-half times as many children of superior intelligence as are found in the studied

cases or in Terman's unselected group. There are 50 per cent of the selected cases with I.Q.'s which reach or exceed 110. It may be that the criterion of comfortable economic status is responsible for the increase in the proportion of superior children, since it has been found that occupational status correlates positively with intelligence (7, p. 165).

Comparison as to Economic Status

The data on the comparison of the two groups of cases according to economic status are given in Table IV. Of the ninety-four selected for this study, 93 per cent were listed as belonging in the comfortable group and 7 per cent in the affluent group.

TABLE IV

A COMPARISON OF THE TWO GROUPS OF CASES ACCORDING TO ECONOMIC STATUS

Economic Condition	Cases in Group		Per Cent	
	Selected	Studied	Selected	Studied
Dependent	0	147	0	12
Marginal	0	573	0	48
Comfortable	87	402	93	34
Affluent	7	25	7	2
Not reported	0	48	0	4
Total	94	1195	100	100

Comparison as to Marital Status and Physical Defects

No statistics were available for comparing the selected cases with the studied cases of the three clinics as to the number of own parents living with the children or as to physical defects found. One case in which the child had a stepmother was included in the group of cases used in the estimation of the reliability and validity of the guide. With the exception of the section on the analysis of the problems, this case is not included in the data presented in this section of the study. In its place statistics are taken from one of the cases which met the conditions set by the criteria but through oversight was not analyzed to estimate the parental attitude.

Comparison as to Sex and Age

The following tabulation shows the comparison of selected cases with studied cases as to sex. There are a few more than twice as many boys as girls in both groups. Our sample is almost identical in this respect to the total number of studied cases from the three clinics.

Sex	Cases in Group		Per Cent	
	Selected	Studied	Selected	Studied
Boys	65	816	69	68
Girls	29	379	31	32
Total	94	1195	100	100

It appears from the following tabulation that the selective factors have drawn from the studied cases a somewhat younger group of children. The standard error of

Age	Cases in Group		Per Cent	
	Selected	Studied	Selected	Studied
1 to 4	7	46	7	4
5 to 9	44	401	47	34
10 to 14	39	588	42	49
15 to 19	4	159	4	13
20 and over	0	1	0	0
Total	94	1195	100	100

the difference between the per cent of children between the ages of five and nine in the two groups indicates that some factor other than chance is at work, as the difference is two and one-half times the standard error of the difference. The smaller percentage of children in the age groups from ten to fourteen is not statistically significant, but in the group from fifteen to nineteen it is great enough to insure against chance. It is safe to state that the group as a whole is younger than it would have been by chance selection.

Comparison as to Nativity

Ninety-six per cent of the children selected for study were born in the United States. Three of the four foreign born children were from Canada, so that the need

for adjusting to the manners, customs, and mode of living in a foreign country faced by the children in this study is practically nonexistent. The emotional strain caused by moving to a new country, by being unable to speak the new language, by needing to adjust to a different system of education, or by being demoted to a lower grade in the new country because of a language handicap is also a factor which does not enter into the etiology of the problems of the children studied here. The following tabulation shows the nativity of patients in relation to the nativity of parents:

	Cases in Group		Per Cent	
	Selected	Studied	Selected	Studied
Native born of native parents	64	584	68	49
Native born of one native and one foreign parent	9	115	10	10
Native born of foreign parents	15	356	16	30
Foreign born of foreign parents*	2	52	2	4
Nativity of one or both parents unknown	4	88	4	7
Total	94	1195	100	100

*Four patients were foreign born, three in Canada.

The selected cases contained 19 per cent more native born children of native parents than the studied cases. They also contained 14 per cent fewer children who were native born of foreign parents. As these differences are more than three times the standard error of the difference, they are statistically significant. The per cent of foreign born of foreign parents and of native born of one native and one foreign parent is nearly the same in both groups. Since 68 per cent of the children were native born of native parents, the necessity for learning two languages did not exist in these homes.

According to Table I, 73 per cent of the parents in this study were native born, so that the need for adjusting to life in a new country was not a factor in the development of their emotional patterns. The adjustment of one parent to the other may be complicated by differences in nationality. Different tastes in clothes, food, home furnishings, family ideals and customs, and ideas of child guidance are possible causes of friction between parents. Such differences of opinion may produce conflicting loyalties in the child who feels the need to agree with one parent against the other, or to agree with both even though each disagrees with the other. This state of affairs may be one source of emotional conflict which results in problem behavior. In only 10 per cent of the cases of this study was one parent native born and the other foreign born. Of the foreign born parents, in two cases the parents were of different national origin, making a total of 12 per cent in the group of parents of differing national background. In about 85 per cent of the cases the parents were of the same nationality, which would tend to eliminate wide differences of opinion due to different national backgrounds.

TABLE I

COMPARISON OF SELECTED WITH STUDIED CASES AS TO NATIVITY OF PARENTS

Nativity of Parents	Selected			Studied		
	Father	Mother	Both	Father	Mother	Both
	Cases					
Native born	65	72	137	635	676	1311
Foreign born	25	19	44	493	455	948
Not reported	4	3	7	67	64	131
Total	94	94	188	1195	1195	2390
	Per Cent					
Native born	69	77	73	54	57	55
Foreign born	27	20	23	41	38	40
Not reported	4	3	4	5	5	5
Total	100	100	100	100	100	100

More of the parents in the selected group were native born than in the studied group. This difference (18 per cent) is almost certainly not due to chance, as it is more than three times the standard error of the difference.

Comparison as to Religion of the Parents

The following tabulation shows the comparison of the selected cases with the

studied cases as to religion of the parents:

Religion	Cases in Group		Per Cent	
	Selected	Studied	Selected	Studied
Protestant	57	581	61	49
Roman Catholic	5	273	5	23
Jewish	14	196	15	16
Greek Catholic	0	19	0	2
Other	2	42	2	3
Mixed	9	40	10	3
None	1	7	1	1
Not reported	6	37	6	3
Total	94	1195	100	100

The selected cases had 12 per cent more families in which both parents were of the Protestant religion and 18 per cent fewer families in which both parents were of the Roman Catholic faith than occurred in the studied cases. For the latter group the difference is statistically significant. In the former group and in the portion of the selected group in which parents were of different religions, the differences are not quite three times the standard errors. One of the factors which may disturb the atmosphere of the home is difference in religious belief of the parents. In the selected group there is a possibility that this might be one cause of the child's emotional problem in 10 per cent of the cases.

Comparison as to Race

Only two children in the selected cases were of the colored race, so that the percentage for the white race was 98. Since racial conflict may be a cause of severe emotional strain, it is to be regretted that membership in the white race was not one of the criteria for the selection of cases in order to make a more homogeneous group.

COMPARISON AS TO BEHAVIOR PROBLEMS OF SELECTED GROUP WITH FULL STUDY CASES OF CLINIC B

In this group of native born white children of average or superior intelligence, in good health, living in comfortable homes with both of their own parents, most of whom were native born, one might expect to find fewer problems in the record of their experience than in the large unselected clinic population. Unfortunately, no statistics were available on the percentage of the problems found in the total number of studied cases from the three demonstration clinics because the research statistician of the Commonwealth Fund decided that the differences in classifications of problems made the summarization infeasible. Since the writer checked from the case records themselves all the problems found in the selected cases on the composite list of problems, there is ample justification for totaling the problems found in the selected cases of Clinics A, B, and C. Table II shows the incidence of the problems which occurred four or more times on the composite list.[1] A summary of the problems found in ten or more of the studied cases of Clinic B was available. These are presented in Table III. Although the frequency of problems in this table cannot be assumed to be representative of the frequency of such problems in the three child guidance clinics, it is reproduced here to be used in comparing the percentage of problems found in the selected cases with that found in full-study cases of Clinic B.

Differences

Of these sixteen problems, the differences in percentage of selected cases and Clinic B studied cases reaches statistical significance in only one instance. "School work poorer than ability would warrant" is found in 24 per cent of the selected cases, whereas "poor school work " was recorded in only 7.7 per cent of the studied cases of Clinic B; this is 3.3 times the standard error of the difference. If the problem "school maladjustment" in the studied cases is added to the latter, it raises the percentage of 12, making the difference only 2.4 times its standard error.

As used by the writer, "school work poorer than ability would warrant" includes all cases of school failures and those cases in which the children were receiving poor marks if the child's school placement was not higher than would be correct for his chronological age. Cases in which children

1. The composite list is a list of children's problems compiled by the author.

TABLE II

PROBLEMS REVEALED IN SELECTED CASES IN FOUR OR MORE INSTANCES

Problem	Group			Per Cent		
	Boys	Girls	Total	Boys	Girls	Total
Aggressive Behavior						
Defiance of authority*	10	2	12	15	7	13
Negativism	11	4	15	17	14	16
Disobedience*	11	5	16	17	17	17
Stealing*	23	4	27	35	14	29
Lying--defensive*	27	5	32	42	17	34
Disorderly conduct--school	7	1	8	11	3	9
Domineering	12	3	15	18	10	16
Quarrelsomeness	19	1	20	29	3	21
Boasting	17	6	23	26	21	24
Cruelty	8	0	8	12		9
Inability to get along (children)	25	3	28	38	10	30
Sex play	7	5	12	11	17	13
Temper tantrums*	14	8	22	22	28	23
Withdrawing Behavior						
Daydreaming*	15	2	17	23	7	18
Lying--imaginative	6	2	8	9	7	9
Lying--expansive	4	0	4	6		4
Shyness*	10	3	13	15	10	14
Fearfulness	5	2	7	8	7	7
Distractibility	13	2	15	20	7	16
Depressiveness	4	0	4	6		4
Preference for own sex	5	1	6	8	3	6
Not fully accepting own sex	4	1	5	6	3	5
Seclusiveness*	8	2	10	12	7	11
Egocentricity	9	2	11	14	7	12
Excessive reading	6	2	8	9	7	8
Evasiveness	8	1	9	12	3	10
Sulkiness	7	3	10	11	10	11
Resentfulness	7	1	8	11	3	9
Habits						
Habit spasms	5	2	7	8	7	7
Thumb and finger sucking*	4	2	6	6	7	6
Nail biting*	14	8	22	22	28	23
Speech defects	7	1	8	11	3	9
Masturbation*	8	2	10	12	7	11
Sleep walking or talking	8	8	16	12	28	17
Enuresis*	14	4	18	22	14	19
Night terrors*	4	4	8	6	14	9
Educational Problems						
School work poorer than ability	20	3	23	34	10	24
Inattentiveness	13	2	15	20	7	16
Lack of interest in work	6	0	6	9		6
Carelessness in work	4	0	4	6		4
Miscellaneous						
Feeding problems*	11	10	21	17	34	22
Concern over health	3	7	10	5	24	11
Excitability	7	3	10	11	10	11
Jealousy*	6	4	10	9	14	11
Inability to carry responsibility	7	0	7	11		7
Overactivity	10	3	13	15	10	14
Submissiveness	6	0	6	9		6
Truancy	13	1	14	20	3	15

*The sixteen problems compared with Clinic B problems.

TABLE III

SYMPTOMS FOUND IN FULL-STUDY CASES IN CLINIC B**

Symptoms	Studied Cases			Per Cent		
	Boys	Girls	Total	Boys	Girls	Total
Conduct						
Stealing*	89	34	123	35.9	29.9	34.0
Lying*	74	40	114	29.8	35.1	31.5
Temper tantrums*	63	47	110	25.4	41.3	30.4
Resentment of authority	29	16	45	11.7	14.1	12.4
Disobedience*	32	6	38	12.9	5.3	10.5
Running away	29	7	36	11.7	6.1	9.9
Swearing, obscenity	24	7	31	9.7	6.1	8.6
Truancy from home	25	1	26	10.1	.9	7.2
Fighting, cruelty	23	2	25	9.3	1.7	6.9
Unmanageableness	19	4	23	7.7	3.5	6.4
Destructiveness	18	4	22	7.3	3.5	6.1
Truancy (not specified as to home or school)	14	3	17	5.7	2.6	4.7
Bullying	13	2	15	5.3	1.7	4.2
Sex activity or misconduct	6	9	15	2.4	7.9	4.2
Smoking	11	1	12	4.4	.9	3.3
Educational Problems						
Inattention, dislike, lack of interest in school	55	16	71	22.2	14.1	19.6
Truancy from school	61	8	69	24.6	7.0	19.1
Mischievous in school	31	7	38	12.5	6.1	10.5
Poor school work*	24	4	28	9.7	3.5	7.7
School unadjustment	12	5	17	4.8	4.4	4.7
Habits						
Nail biting*	56	25	81	22.6	22.0	22.4
Enuresis*	43	24	67	17.3	21.1	18.5
Masturbation*	44	10	54	17.8	8.8	14.9
Poor eating habits*	30	21	51	12.1	18.5	14.1
Sleep talking	17	7	24	6.9	6.1	6.6
Poor sleeping habits	6	6	12	2.4	5.3	3.3
Finger sucking*	5	5	10	2.0	4.4	2.8
Night terrors*	5	5	10	2.0	4.4	2.8
Personality						
Feelings of inferiority	75	33	108	30.3	29.0	29.8
Conflicts	30	44	74	12.1	38.6	20.4
Fears	34	31	65	13.7	27.2	17.9
Inadequate personality and feelings of inadequacy	34	29	63	13.7	25.5	17.4
Sensitiveness	31	20	51	12.5	17.6	14.1
Feelings of insecurity	27	20	47	10.9	17.6	13.0
Restlessness	36	11	47	14.5	9.7	13.0
Daydreaming*	32	13	45	12.9	11.4	12.4
Timidity, shyness, fearfulness	27	16	43	10.9	14.1	11.9
Stubbornness	30	12	42	12.1	10.6	11.6
Hyperactivity	18	12	30	7.3	10.6	8.3
Instability	6	23	29	2.4	20.2	8.0
Overimaginativeness	10	18	28	4.0	15.8	7.7
Neurotic tendencies	11	15	26	4.4	13.2	7.2
Infantile reactions	13	10	23	5.2	8.8	6.4
Jealousy*	14	8	22	5.6	7.0	6.1
Shut-in, seclusiveness*	15	7	22	6.0	6.1	6.1

*The sixteen problems compared with problems in selected cases.

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TABLE III (Continued)

SYMPTOMS FOUND IN FULL-STUDY CASES IN CLINIC B**

Symptoms	Studied Cases			Per Cent		
	Boys	Girls	Total	Boys	Girls	Total
Personality						
Doesn't mix well with children	16	5	21	6.4	4.4	5.8
Frequent crying	13	7	20	5.2	6.1	5.5
Suggestibility	12	6	18	4.8	5.3	5.0
Irritability	14	3	17	5.6	2.6	4.7
Adolescent instability	1	15	16	.4	13.2	4.4
Domineering	7	6	13	2.8	5.3	3.6
Negativism	6	6	12	2.4	5.3	3.3
Mother attachment	9	1	10	3.6	.9	2.8
Miscellaneous						
Mental retardation or dullness	38	21	59	15.3	18.5	16.3
Physical overgrowth or retardation	22	9	31	8.9	7.9	8.6
Stuttering	16	2	18	6.4	1.7	5.0
Speech defect	11	3	14	4.4	2.6	3.9
Total	248	114	362			

*The sixteen problems compared with problems in selected cases.

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were retarded according to the mental age but correctly placed chronologically were not listed. Fourteen or 61 per cent of the twenty-three cases in which the problem occurred were children whose I.Q.'s were 110 or better; the I.Q.'s of seven fell between 100 and 109, and those of two were between 87 and 99. Fourteen, or 28 per cent, of the fifty superior children in the selected group were doing poor work in school.

Similarities

In the fifteen remaining problems on which the groups may be compared, the differences in the percentages are not large enough to characterize the two groups as being significantly different in these respects. Less than 3 per cent of variation is found in the incidence of nail biting, enuresis, shyness, and defiance of authority. Defensive lying belongs in the above group. If imaginative lying and expansive lying, however, were added to defensive lying, the percentage of lying in the selected group would probably be noticeably higher. Problems which varied from 4 to 8 per cent inclusive in their occurrence in the groups are disobedience, stealing, temper tantrums, daydreaming, seclusiveness, thumb and finger sucking, feeding problems, masturbation, night terrors, and jealousy.

Summary of Comparison

Granting that allowance must be made for slight differences in tabulating problems and in interpreting the terms used, still the surprising similarity in the percentage of occurrence of these problems in the two groups points to the need for further search for the causes of the problems. Poverty, broken homes, subnormal intelligence, physical defects, and foreign nativity were not causative factors. In spite of the fact that the selected cases included children who were of average intelligence, in good health, living in comfortable homes with both of their own parents, most of whom were born in the United States of native born parents, the study of these children revealed very nearly the same percentage distribution of certain problems as were found in the cases of 362 children from Clinic B. In respect to the sixteen problems discussed, the groups are much more alike than different. The selected group had more children with feeding problems, more children doing poor school work in spite of the greater percentage of superior children, and possibly more children who were reported for lying. The greater number of feeding problems might be caused by the fact that the selected cases contained more young children than the total clinic group as represented by the studied cases.

PROBLEMS IN RELATION TO PARENTAL ATTITUDES

A child's behavior is a problem only in so far as it is interpreted as undesirable from the point of view of his development or his social relations. When teachers (15) and parents (9) were asked to rate a series of behavior reactions of children as to their seriousness, they differed markedly from the mental hygienists who rated the same series of reactions. The latter considered most serious behavior which indicated that a child was adjusting to his environment by withdrawing from it. With the

recognition that one of the characteristics of a psychotic patient is a withdrawing from reality in varying degrees to the point of such complete dissociation that the patient is described as disoriented and out of contact with the outer world, the importance of discovering tendencies towards withdrawal before they become well-fixed has turned the attention of mental hygienists to such behavior in children.

For use in this study, the writer grouped the problems in the composite list under withdrawing behavior, aggressive behavior, habits, and educational problems. Generally speaking, behavior which indicates that a person is seeking contacts with people may be described as aggressive in contrast to withdrawing behavior which points to a tendency to avoid making contacts with people.

There are many types of behavior which cannot be classified as withdrawing or aggressive tendencies, as the interpretation depends on the purpose which it serves. Truancy, for instance, may be a withdrawal from an unpleasant situation, a defiance of authority, or both. It may also be a reaching out for a pleasant reality. In studying any behavior incident it is important to know the purpose which it serves for the individual. One type of adjustment may be used at one time and another in a different situation by the same person. Nevertheless, withdrawing tendencies characterize the behavior patterns of some individuals and aggressive tendencies those of others. Fortunately, it is possible to help children change their methods of adjustment if the environment can be arranged so that they will gain necessary emotional satisfactions.

Incidence of Different Attitudes

When ninety-four cases were analyzed by means of the guide, it was found that in thirty cases the information concerning either the father or the mother was inadequate for estimating his or her attitude and, therefore, was given a zero rating.[1] Since the relationship of both parents to the child is important, all cases with zero ratings for either parent were omitted, leaving sixty-four cases to be used in the study of the children's problems. A division of all possible combinations of attitudes of both parents resulted in fourteen groups (Table IV).

TABLE IV

DISTRIBUTION OF PROBLEMS IN CASES GROUPED ACCORDING TO THE ATTITUDES OF BOTH PARENTS

Groups	Number in Group			Mean Number Problems Per Child	Range of Problems Per Child
	Boys	Girls	Total		
Parental Attitudes					
Mother negative, father negative	11	2	13	8.3	6 to 14
Mother overprotective, father negative	9	0	9	8.8	5 to 16
Mother negative, father positive	6	6	12	6.2	1 to 9
Mother negative, father ambivalent	3	2	5		
Mother overprotective, father ambivalent	1	2	3		
Both overprotective	3	2	5		
Mother overprotective, father positive	4	0	4		
Mother negative, father overprotective	1	1	2		
Mother ambivalent, father negative	3	0	3		
Mother ambivalent, father positive	0	2	2		
Mother ambivalent, father ambivalent	1	0	1		
Mother positive, father ambivalent	1	0	1		
Mother positive, father positive	1	1	2		
Mother positive, father negative	2	0	2		
Ratings Not Considered Parental Attitudes					
All combinations of rating	65	29	94	7.0	1 to 18
Zero ratings omitted	46	18	64	7.5	1 to 16
Mother zero, father zero	10	7	17		
One parent zero and other not zero	9	4	13		

1. The ratings on the ninety-four cases as assigned by the writer were used. When children's problems are under consideration, all ninety-four of the group of selected cases are used, while in cases dealing with parents' attitudes the number becomes sixty-four after omitting the thirty cases with zero ratings.

One of the most interesting results in this table is the discovery of the small number of positive ratings given for the mother's attitude. This may be due in part to the difficulty of identifying the overprotective attitudes by means of the guide. It may confirm the opinion, however, that rejected children are referred to child guidance clinics, whereas children to whom the mothers are attached are brought to pediatric clinics because their mothers are oversolicitous concerning their health. These may appear later in child guidance clinics showing neurotic traits.

Fifty per cent of the mothers and 42 per cent of the fathers have negative attitudes towards their children as estimated in this study. If the guide has been a successful instrument in identifying cases of overprotection that are really disguised rejection, fifty-three, or 83 per cent, of the children are rejected by the mothers and thirty-four, or 53 per cent, are rejected by the fathers. It is possible that some of the overprotective cases are cases in which the mother's attitude is positive, so that the percentage may be too high. The greater number of overprotective mothers than fathers is interesting in view of the fact that overprotection has generally been referred to in the literature as a characteristic of mothers. The following tabulation shows the distribution of parental attitudes:

Parental Attitude	Cases in Group		Per Cent	
	Mother	Father	Mother	Father
Positive	5	20	8	31
Negative	32	27	50	42
Overprotective	21	7	33	11
Ambivalent	6	10	9	16
Total	64	64	100	100

Relation of Problems to Attitudes

The selected group of ninety-four cases is more like the studied group of Clinic B than it is different from it in the incidence of certain problems in the lives of the children studied. Eliminating the broken home situation (step-parents, foster-parents, widowed mothers, and institutional environment), subnormal intelligence, economic dependency, and gross physical defects from the factors in the selected cases did not reduce significantly the percentage of stealing, lying, enuresis, nail biting, defiance of authority, disobedience, and several other problems which are frequently found in the cases of children referred to child guidance clinics. Two other limiting conditions were added to the four criteria of selection with the result that native born children and white children were inadvertently selected in 96 per cent of the cases. Seventy-three per cent of the parents were native born, so the problem of adjusting to the social conditions of a new country did not exist for them. It was hoped that the problems found in this carefully selected group of cases might make evident the relation between parental attitudes and certain types of behavior problems.

Groups Studied.--When the sixty-four cases were classified in fourteen groups according to the parental attitudes in the case, there were only three groups with sufficient cases in them to warrant a discussion of the findings. The groups are described below.

The attitudes of both parents in Group 1 were estimated to be negative. The group contained thirteen children, eleven boys and two girls whose ages ranged from three years, two months to fourteen years, nine months; the I.Q.'s ranged from 92 to 154. This will be referred to as the rejected group.

In Group 2 the mother's attitude was assigned to the overprotective category, the father's to the negative. There are nine boys in this group whose ages ranged from seven years, zero months to fourteen years, eleven months; their I.Q.'s ranged from 96 to 134.

The mother's attitude is listed as negative and the father's as positive in Group 3, which contains an equal number of boys and girls. The twelve children ranged in age from three years, zero months to ten years, seven months; in I.Q. they ranged from 97 to 140.

The range for all thirty-four children in age is from three years, zero months to fourteen years, eleven months and in I.Q. from 92 to 154. There are twenty-six boys and only eight girls.

Findings for the Three Groups.--In the

subtotals of withdrawing behavior, as shown in Table IV, Group 3 has seven problems listed in contrast to twenty-two listed for Group 1, the rejected group, and twenty-eight for Group 2, the overprotected group. There was an average of 1.7, 3.1, and 0.6 withdrawing problems per child in Groups 1, 2, and 3 respectively. No conclusions can be drawn from so few cases as the significance of the difference cannot be determined.

If the theory that to develop outgoing personality tendencies a child needs the security afforded by the love and protection of his parents or parent-surrogates is correct, the children in Group 3 have had a greater chance of developing outgoing tendencies than the children in Groups 1 and 2 since one of the parental attitudes was estimated to be positive. The fact that this happened to be the father's may be fortuitous. Group 3 also has fewer problems per child than Groups 1 and 2, as may be seen in Table IV,

Group 3 has 1.3 fewer problems per child than the total group of sixty-four cases. It also has a range which, although as wide as the other two groups, is lower on the series of problems, being 1 to 9 as compared to 6 to 14 for Groups 1 and 5 to 16 for Group 2.

Group 2, with mother's attitude overprotective and father's negative, has the greatest number of problems of the withdrawing type and the largest average of all types. The number of cases is so small that the results merely point to the fact that future investigation by this method may support the theory mentioned above. It is to be regretted that there is not a comparable group of cases in which the attitudes of both parents are positive, so that the effect of the mother's positive attitude could also be studied.

An important point is discovered by a study of the data. If the mothers with negative attitudes had been studied together, Groups 1 and 3 would have been treated as one and unquestionably the smaller number of withdrawing behavior reactions in Group 3 would not have been evident. This fact points out the danger that exists in basing conclusions on studies of children's behavior in relation to the behavior or attitude of one parent only. In most of the research on parental attitudes and children's problems, the emphasis is on the mother-child relationship.

TABLE V

PROBLEMS APPEARING IN FOUR OR MORE OF THE NINETY-FOUR CASES FOR THREE SPECIAL GROUPS

Problem	Special Groups		
	1	2	3
Aggressive Behavior			
Defiance of authority	1	1	2
Negativism	2	1	2
Disobedience	5	1	2
Stealing	6	3	1
Lying	7	3	3
Disorderly conduct in school	3	0	0
Domineering	3	1	3
Quarrelsome	5	3	1
Boasting	3	0	3
Cruelty	2	1	0
Inability to get along (children)	4	5	4
Sex play	2	1	2
Temper tantrums	5	1	3
Total	48	21	26
Mean	3.7	2.3	2.2
Withdrawing Behavior			
Daydreaming	1	4	2
Lying--imaginative	2	1	0
Lying--expansive	1	0	1
Shyness	1	3	0
Fearfulness	2	0	0
Distractibility	2	2	1
Depressiveness	2	2	0
Preference for own sex	0	1	0
Not fully accepting own sex	1	1	1
Seclusiveness	0	4	0
Egocentricity	4	2	0
Excessive reading	1	3	0
Evasiveness	3	1	1
Sulkiness	0	3	1
Resentfulness	2	1	0
Total	22	28	7
Mean	1.7	3.1	.6
Undesirable Habits			
Habit spasms	0	2	0
Thumb and finger sucking	1	1	2
Nail biting	5	2	7
Speech defects	0	1	2
Masturbation	1	1	2
Sleep walking and talking	0	0	3
Enuresis	6	3	2
Night terrors	2	0	0
Total	15	10	18
Mean	1.2	1.1	1.5
Educational Problems			
School work poorer than ability	6	4	1
Inattentiveness	1	1	3
Lack of interest in work	2	1	1
Carelessness in work	1	0	1
Total	10	7	7

TABLE V (Continued)

PROBLEMS APPEARING IN FOUR OR MORE OF THE NINETY-FOUR CASES FOR THREE SPECIAL GROUPS

Problem	Special Groups		
	1	2	3
Miscellaneous			
Feeding problems	2	1	4
Concern over health	1	1	1
Excitability	1	0	2
Jealousy	0	2	1
Inability to carry responsibility	0	1	0
Overactivity	2	1	3
Submissiveness	0	1	0
Truancy	2	3	0
Total	8	10	11
Grand Total	103	75	68

Even though the father is usually not with the child as much as is the mother, his influence is significant.

For an adequate study of the problem, each of the above groups should be divided according to sex. It must be remembered that the age of the child studied will probably affect the incidence and type of problems found. The three groups reported here are too small to have been divided according to the age levels of the children.

Group 1, the rejected group, has the largest number of aggressive behavior reactions per child. This agrees with the results of Figge (2), who found that children of rejecting mothers showed more aggressive and rebellious behavior than the control group of nonrejected children.

The entries on the large chart suggested the association of enuresis with rejection by both parents if estimated overprotective attitudes were considered as disguised rejection as it is defined in this study. In fourteen of the thirty-four cases in Groups 1, 2, and 3, enuresis had been a part of the patient's experience. Seven of these cases were classified in Group 1 and five in Group 2. These twelve cases were boys whose fathers were rejecting them and whose mothers were rejecting them openly or in a disguised manner.[1] The other two cases of enuresis were reported in Group 3, one girl of six years, eight months and one boy of five years, five months. The age range of the cases of present enuresis was from five years, five months through eleven years, six months with the exception of one boy of three years, two months. Seven, or 63 per cent, of the eleven boys in Group 1 had enuresis as part of their developmental picture; six were still manifesting this problem at the time of clinic study although with three it only occurred occasionally. Five, or 55 per cent, of the boys in Group 2 had enuresis; four had overcome the habit at the time of the study.

Group 3, with mother's attitude negative and father's positive, has the greatest number of nail biters, seven of the twelve children having this habit. In Group 1 five of thirteen children have this listed for them. Only two of the nine children in Group 2 are reported to bite their nails. Groups 1 and 3 have one constant factor, the mother's frank rejection of them. Twelve of the twenty-five children in these two groups bite their nails in contrast to two of the nine children whose mothers are overprotective. Since negative attitudes are defined as evidence of friction and irritation, these results would agree with those of Viets (12) who found nail biting associated with tension in the home.

Six of the thirteen children in Group 1 and four of the nine children in Group 2 have school work poorer than ability would warrant checked against them, whereas only one of the twelve children in Group 3 is so reported. Although 44 per cent of the children whose mothers are overprotecting them are doing poorer school work than they might be expected on the basis of their I.Q.'s, which agrees with the findings of Shane (8) and Weir (14), still 46 per cent of the children in Group 1 present the same picture.

Five, or 55 per cent, of the nine children in Group 2 are reported to have or to have had a tendency towards daydreaming, whereas only one child in Group 3 and two children in Group 1 have such a record. Four children from Groups 1 and 3 and five from

1. In this discussion cases of past and present enuresis are included, whereas in Table V only present enuresis is counted.

Group 2 are reported to have an inability to get along with children. The groups seem to be similar in this respect. Seven of the eleven boys in Group 1 are reported to lie defensively, whereas only three of the nine boys in Group 2 have this listed and only two of the six boys and one girl in Group 3 have this problem. Six of the eleven boys in Group 1 have stealing checked, while only one boy in Group 3 and three in Group 2 have this record.

The findings presented are merely tentative and suggestive of the value of further research of this type. A greater number of cases should be analyzed and divided into groups not only according to the attitudes of both parents but according to sex and age levels. A detailed analysis of the case records of the cases in any one of the various groups could profitably be undertaken as a research project.

LIMITATIONS OF THE STUDY

The analysis of the disagreement between two workers using the guide showed the need for making certain improvements in it. The results of the study are, of course, affected by the weaknesses of the guide. The identification of overprotective attitudes needs further specialized study.

Some of the case records used were compiled as long ago as 1923 when clinicians were not as conscious of the importance of parent-child relationships in the study and solution of children's problems as they were later. Some of these records contained inadequate material for estimating the parent's attitude. As a result, instead of having data from approximately 100 cases, the number dropped to sixty-four when all the cases in which the attitudes were rated zero were omitted. This fact was not discovered until all the experimental work was completed.

When the sixty-four cases were divided into fourteen groups according to all possible combinations of mother's and father's attitudes, the number in each group was too small for the findings to carry much weight. The results do show, however, that further research in this direction would be worth while.

SUMMARY AND CONCLUSIONS

The purpose of the study was twofold: (1) to develop a technique for the classification of cases according to the indications of the parent's emotional attitude towards his child, and (2) to classify approximately 100 cases by means of the technique developed, making a comparative study of the age, sex, and problems of the children whose cases fall in the various categories according to the parent's attitude.

Fifty-five statements referring to parental responsibility, methods, and reactions in handling the child were selected from 589 statements of parents' reactions in twenty-one cases of problem behavior in children. These, with thirty-seven additional statements for identification of overprotection, were rated by three clinicians on the scale 4+, 0, 4-. Statements which did not meet the criterion (any percentage greater than 50 per cent plus three times its probable error) were rejected.

Study of Ninety-Four Selected Cases Analyzed by Means of the Guide

From the files of three closed demonstration child guidance clinics, ninety-four cases were selected in which (1) there were no gross physical defects recorded for the child, (2) both parents were living in the home at the time of the child's reference to the clinic, (3) the economic status of the family was rated comfortable at that time, and (4) the child's I.Q. was over 85. The children's problems found in each one of these cases were recorded on a composite list of problems compiled for this purpose. Data concerning the child's age, sex, I.Q., nativity, and race and data concerning the nativity of the parents and the religion and economic status of the family were collected. The ninety-four cases were compared with 1,195 cases of the three clinics which were studied for a report of the work of the demonstration clinics. The selected cases were divided into fourteen groups according to all possible combinations of attitudes of both parents as assigned by the guide. The children's problems occurring in the cases assigned to the three largest of these groups were studied.

The findings given below are based on an analysis of the case material:

1. The four criteria used in the selection of cases for study have drawn out from the total clinic population a group which is not significantly different from it as to: (1) sex; (2) per cent of children of average intelligence; (3) per cent of cases in the affluent economic group; (4) per cent of children who were foreign born of foreign parents and those who were native born of one native and one foreign parent; and (5) per cent of children of the Protestant religion, Jewish religion, "mixed religions", no religion, and "other" religions. They have selected a group which was different in that it was slightly younger, contained two and one-half times as many children of superior intelligence, more native born children of native parents, more native born parents, more families, of the comfortable or affluent economic status, and fewer families of the Roman Catholic religion.

The selected group was not significantly different from the studied cases of Clinic B as to the incidence of nail biting, enuresis, shyness, defiance of authority, disobedience, stealing, temper tantrums, feeding problems, daydreaming, seclusiveness, thumb sucking, masturbation, night terrors, and jealousy. Allowance must be made for possible differences in recording and summarizing these problems. The selected group had a higher percentage of school work poorer than ability would warrant.

2. In sixty-four cases, 50 per cent of the mothers were estimated to have a negative attitude toward the child; 42 per cent of the fathers were so rated. If the guide has been successful in identifying cases of overprotection due to disguised rejection, 83 per cent of the mothers were rejecting their children.

3. Enuresis in boys appears to be associated with rejection by the father accompanied by rejection or overprotection by the mother as the attitudes were estimated by the guide.

4. The greatest number of withdrawing problems per child as well as the greatest number of all problems per child is recorded for the group that is overprotected by the mother and rejected by the father, according to the guide.

5. The smallest number of withdrawing problems per child is reported for the group in which the mother's attitude is negative and the father's positive. The average number of problems of all types per child is smaller for this last group than for either of the other two groups studied and for the total group of ninety-four children as well.

6. The group of children judged to be rejected by both parents has the greatest number of aggressive behavior problems listed for it.

7. If all the rejecting mothers were studied in one group, the differences between the groups divided on the basis of different attitudes of fathers would not have been apparent and the points made concerning enuresis would not have been observable.

Conclusions

1. There was a nucleus of agreement among the clinicians in regard to the indications of parental attitudes in certain types of parental behavior sufficient to justify the construction of the guide. It is possible by the method used in this study to find areas of agreement and areas of disagreement among clinicians.

2. In view of the subjective elements deliberately retained in the guide, chiefly in the decision whether a particular item is a significant indication of the parents' attitude, there is a high degree of agreement between two raters using the guide independently. This may be due in part to the similar factors in the training of the two raters. This should not minimize the value of the guide, as it is intended for use on case data by persons trained in clinical work with children. The high degree of agreement obtained with the method in a developmental stage would indicate that further refinement of this method would be profitable.

3. It is difficult to gain an accurate estimate of the validity of the guide because of the limitations of the data used as an independent criterion. Rough as the only available estimate of validity is, it points to possibilities for developing objective means of regularizing subjective judgments of material so complex that certain subjective elements need to be retained.

4. The selected cases represent a group of children for whom economic stress, the

broken home situation, gross physical defects, subnormal intelligence, foreign origin, foreign parentage, and membership in the colored race were not major causative factors of the problems which resulted in their being referred to a child guidance clinic. In spite of this fact, the selected group is more like the studied group of Clinic B than it is different from it in the incidence of sixteen problems for which children are frequently referred to child guidance clinics.

5. If the guide has been a successful instrument in identifying cases of overprotection which are disguised rejection, or in other words a negative attitude, 42 per cent of the fathers and 50 per cent of the mothers were judged to have negative attitudes towards their children.

6. The attitudes of both parents should be considered in any study of children's problems since, if all the rejecting mothers in this study had been assigned to one group, the differences between the groups here divided by taking account also of different attitudes of fathers would not have been apparent and the points made concerning enuresis would not have been observable.

7. The conclusions concerning the relation of parental attitudes to children's problems are only tentative, as the groups are so small:

> The cases in which the mother's attitude was estimated to be negative and the father's positive had fewer withdrawing problems than the cases in the other group; the significant factor may be that one parent's attitude is rated positive irrespective of the sex of the parent. This group had fewer problems per child than either of the other groups and the total group as well. Nail biting was recorded oftener than in the other groups.
>
> The children both of whose parents' attitudes were rated negative had more aggressive tendencies than either of the other two groups.
>
> The nine boys whose mothers were overprotecting them and whose fathers were rejecting them had more withdrawing problems than the children in the other groups, as well as the greatest number of problems per child than either of the other groups and the total group as well.
>
> Enuresis appears to be associated in boys with either a negative attitude on the part of the father or on the part of both parents if overprotective cases are regarded as negative.

A GUIDE FOR THE ESTIMATION OF PARENTAL ATTITUDES

DIRECTIONS FOR THE USE OF THE GUIDE

Directions for Recording Case Data

1. Read the section concerning the construction of the guide before attempting to apply these directions. (See page 172.)

2. Fill in the case number and other identifying data before starting to chart the case.

3. Note the separate columns for reactions of the mother and of the father and take great care to enter their respective reactions in the proper columns.

4. Read the list of general statements and their examples two or three times so that you will be familiar with the types of incidents which should be selected from the record.

5. Read the section on the significance of incidents in the record before attempting to chart the data. This is extremely important as you must decide in the light of all the material in the record whether or not an incident is an indication of the parent's feeling for the child. (See page 172.)

6. Decide at what point in the development of the case the parent's attitude is to be estimated, that is, at the time the patient was referred to the clinic, at the time of the staff conferences, or at some point during the treatment.

7. Read through the case record to the point decided upon under 6, recording on the chart each item of the guide found in the record. List them by entering the number of the page on which they occur on the proper line of the chart. If an item is listed from the Physical Examination, record it as Ph. 1 or 2 or whatever its page number is; if an item is selected from the Psychological Examination, place a Po before its page number; from the Psychiatric Examination, a Pi; and from Treatment, a T.

8. List every item every time it occurs in the record. If you decide that it is not a significant indication of the parent's attitude, draw a line through the entry on the chart. If you have difficulty in deciding, list it with a question mark, place a penciled check on the margin of the record and go back to the item after you have read the entire case.

9. Do not make more than one entry on the

chart for the same incident of behavior, as, for example, under "compares child unfavorably" and under "criticizes child." An item may, however, be entered on the main chart and on the key points, as, for example, under "makes no exceptions, never gives in" and under "discriminates against child."

10. Do not mark for either parent an item stated in such a general way as "The parents say that they, etc." or "The mother plays with the children." List only items which refer specifically to the father or mother or to a particular child. Incidents which took place long ago, discontinued practices, and behavior which characterized the parents' reaction to the child at an earlier period of his development are to be entered in the proper place on the chart but should be encircled.

11. If a parent has made a promise to the child, enter it with a question. If the promise is not fulfilled, cross off the item after reading the entire case.

Directions for Final Estimate

Preliminary Instructions.-

1. Read over the guide with this particular case in mind to be sure that no incidents in the case have been omitted.

2. When the case is read, look over the items that have been entered on the chart to see whether or not in the light of the whole case they still seem to be significant indications of the parent's emotional reaction to the child. There may be items, such as "a child helping his mother" as a pathetic means of gaining her attention, or "a parent spanking a child" which occurs very seldom and only because parent regards it as a traditional method, which throw a false light on an otherwise clear picture. If a negative item is listed for a parent when most of his items are listed on the positive side or if a positive item is listed when most of the items are on the negative side, think over the circumstances of that incident and decide whether or not it was an isolated occurrence that is not part of the total picture of the parent's attitude, and whether or not some unusual circumstances brought about such a reaction. If the incident does not give a fair view of the trend of the parent's reaction to the child, draw a line through the entry.

3. If an encircled entry is the most extreme entry on the chart, disregard it in the final estimate.

4. As you think over the chart entries, check to see whether they have been recorded in the proper column for each parent.

Estimation of Attitude.-

1. If all the remaining entries on the parent's chart are on the positive side, assign the rating of the most extreme positive category in which an item is entered, that is, 2+, 3+, or 4+. If there are no key point entries, mark the case 0 as inadequate for charting.

2. If all the entries on the chart are positive but if the key points have negative entries, assign the rating of the most extreme positive category in which an item is entered. Mark it overprotection.

In using the key points for deciding on cases of overprotection due to inhibited rejection, it is necessary to keep in mind the fact that, although the statements listed under key points were marked as always being evidence of a positive or negative relationship as the case may be, there is always the possibility of finding exceptional cases in which they do not. For instance, in one case "being with the mother" and "liking to help her", both positive points according to the consensus of opinion of the clinicians, were not indicative of the existence of affection on the mother's part as she was clearly neglecting the child and his reaction was a bid for her attention and affection. In another case, where the mother tried to give the child sex information, it was merely a part of a pattern of overprotection and an attempt on the part of the mother to do the things that a modern mother should do. It is important that the worker make exceptions to these directions when it is clearly necessary. In doubtful instances, the case should be recorded as containing inadequate information for charting, and attitude should be rated 0.

3. If all the entries are on the negative side, assign the rating of the most extreme negative category in which an entry is made, that is, 2-, 3-, or 4-. Absence of key points makes no difference in the final estimate.

4. If, after having considered all the items as suggested in 2 under Preliminary Instructions, there are entries on both the positive and negative sides of the chart, there are three possibilities for recording it:

A. If the majority of the entries on the chart are clearly on the positive side, assign the rating of the most extreme positive category in which an item is entered, labelling attitude overprotection. Absence of key points makes no difference.

B. If the majority of the entries on the chart are clearly on the negative side, record the case as belonging in the most extreme negative category in which an item is entered. When, however, the key points have a positive entry which points to a real affection for the child, place the case in the grouping discussed under C.

C. If the positive and negative entries are about evenly distributed (i.e., if the parent's reaction to the child vacillates between fondness and irritation, both of which seem genuine) assign the ratings of the most extreme positive category in which there is an entry and the most extreme negative category in which there is an entry. Label it ambivalent.

5. If the key points contain both positive and negative entries, assign the ratings of the most extreme positive and the most extreme negative entries on the chart. Label it ambivalent.

6. When the details given in the case are meager and it is not possible to get a picture of the parental attitude from the case, mark the case as inadequate for classification.

ITEMS OF THE GUIDE

(Score 4+)

1. Parent indulges child, cannot refuse requests.

The mother is so proud of the children that she lets them do anything they suggest.

2. Parent cares for child's physical needs to an unusual degree.

He was nursed whenever he cried and most of the night.

He (patient, thirteen years, five months) dislikes going to the barber's for a haircut; he is willing for his mother to cut it for him.

Her father got up each night to give her the bottle, since her mother slept so soundly. He took her up every time she cried.

He (ten years) is always wanting his mother to help him dress, and she often does it, though at present she states that she only does it on the morning when he has to be ready at eight o'clock.

3. Parent sleeps in same bed with child.

The patient (thirteen years) sleeps alone. During the summer, however, he has been sleeping in the same room with his mother but on a separate bed. The patient wants the mother to lie down with him at night. Her excuse is that when he had chores he had to be soothed.

She would only sleep if he (father) would lie down beside her (when she was a little girl).

She (eleven years) had gained weight. Her personal hygiene was better although she still slept with her mother.

4. Parent spends all possible time with child.

Whenever he (father) is away, she (patient) hangs on to him when he returns and likes to be with him on Sundays, going with him to the garage and on errands about the neighborhood. She always likes to go to the store with him.

Her mother is a nurse and whenever she is on a case, Mary goes with her.

His mother goes everywhere with him (seventeen years). Even when he takes a girl to the movies she goes along.

(Score 3+)

5. Parent "pushes" child.

Her mother wants Isabel to be a teacher; he (father) does not force her to do her lessons as soon as she comes home. He thinks child should have some time to play. She (mother) is going to push her ahead (in school).

The mother feels very strongly that the child must accomplish what she herself has been unable to do and must attain a higher social position than her own.

Her father made her practice on the violin for four or five hours a day, and that became very tiresome.

6. Parent gives money, toys, special privileges.

Her father gives her special privileges and extra money, even at times when her mother has definitely refused them.

H. is given money to spend whenever she wants it. She has no regular allowance, but they are generous in giving her money. Her mother supposes she gives her money every day. Teacher says she always had money.

7. Parent does not want child to leave for recreation.

Her father said he could not leave Isabel home alone, that she might be frightened, (so he never takes his wife out in the evening).

The father is quite opposed to the idea of sending L. to the convent. The matter of a summer camp was broached, but Mr. B. was not very enthusiastic as he wished to keep the child at home.

8. Parent spends time with child, playing with or amusing child.

Father takes time from his own work to read to the children for an hour at a

time. He lets the patient take the funny paper out of his hand without protest.

He (patient) wanted to start another troupe, and the mother went to work and made flags for it, but nothing came from the venture.

He (father) is interested in his family--spends considerable time with the children taking them places and playing with them in the evening.

9. Parent gives in to child.

The mother does not think the father is as consistent in his demands on the child as he ought to be. She feels he is too self-sacrificing and gives up his physical comfort in order that the child may have his own way.

He (father) gives way if she cries.

10. Parent excuses child, defends him.

The mother thinks the patient was unfairly treated because the scoutmaster was so busy that the test had to be given by an older fifteen-year-old boy. (The patient had failed the test.)

He (father) felt the....school was responsible for her failure.

According to the father, the mother is excessively concerned over the patient, and she is entirely too willing to excuse the boy.

"I think that what is wrong with L. is that she is too active."

11. Parent is proud of child, praises him.

The mother considers the child of superior intelligence and warrants the sacrifices which she has made in completing the child's education.

He is gentle and sweet in his manner when such a response is courted and his mother has always considered him as the reflection of refinement which she hoped was his natural inheritance; only under a coarse influence does he cover up this fineness in his nature.

According to the mother, F. is quite an imaginative boy, very observing and quick with his hands.

12. Parent sleeps in same room.

The boy sleeps in his mother's room. His father sleeps on a cot in the living room.

(Score 2+)

13. Parent threatens punishment but does not carry it out.

When he took fifty-seven cents a few weeks ago, his mother scolded him and told him to go. He started out of the store, but she called him back and he replied, "I knew you wouldn't let me go."

He (father) is inclined to be easy-going and forgets when he has given orders to the children.

The father says, "I often threaten her with the strap, but that is as far as it goes."

The mother is not a good disciplinarian. She is easy on the children.

14. Parent sees few if any faults.

The father often thinks the child's sauciness is rather funny and, therefore, does not make much effort to correct it.

The mother does not recognize any particular problem in the child.

"I know as soon as they (friends and relatives) begin talking against F. I notice more things that she does and I become so worried I nag and pick at her, whereas if people did not talk to me, I would not think anything about many of the things she does."

Another time the child had taken money from a friend of the mother and later admitted it saying, "I just had to have it to buy some Valentines with." Mary's mother thought this was funny and repeated it many times in Mary's hearing.

15. Parent protects child from unhappiness.

The mother has to shield the children in order to get anything for them at all.

When the children remark upon Daddy not seeming to care for them or his not giving them things as other fathers do, the mother explains to them that it is just his way and that he gives money to mother so that she can give it to them.

16. Parent protects child from what he considers harmful.

His mother had him transferred to the....Junior High to get him away from his associates.

When the neighborhood boys began to tell dirty stories, the mother organized the group into the Knights of Sir Arthur, one of the vows of which was clean speech.

17. Parent makes effort to improve child's condition by carrying out recommendations, etc.

Her mother was faithful in taking the child to the clinic and in giving her daily treatments at home as prescribed.

She thought she would have to move so the children would have a better place to stay.

G. has been more regular in attendance. Even on a day when it rained continuously, her father brought her to

school. (Teacher had reported frequent absences previous to clinic study. Her mother did not show any interest in school problems.)

18. Parent cares for child's physical needs.
The mother takes an interest in her home and her children, looking after their physical needs particularly.
Meals are served regularly and the cleanliness and care of the children surpassed what one finds in the ordinary home.

19. Parent provides financial support.
The father provides well for his family.
He has always earned fairly good wages, seems to have a comfortable home, and is very generous with his family.
The mother has taken the sole responsibility for the children (although separated for several years, with no divorce and no separation allowance).
The mother has supported the children from the first (after her husband's death) by working in a store and, for the last six years, by running one.

20. Parent provides advantages.
The patient learned to swim at the Y.M.C.A.
The boy was at the Y.M.C.A. camp for ten days.
There is a piano bought at O.'s request. There is also a victrola.
Her mother speaks of her desire to have the patient "make something of herself" and is trying to give the girl advantages which she lacked.

21. Parent spends time with child training, teaching, or helping with lessons.
His mother helps him with his home work every day after school.
When the worker asked the mother if the father played with the child, she said, "Not exactly play. He teaches her more."
The father helps with the training of the children.

(Score 1+)

22. Parent is interested in child.
The father is as much interested in patient's welfare as is the mother.

(Score 1-)

23. Parent nags child.
The mother constantly reminds the patient to breathe through his nose.
The mother is constantly coaxing him to eat more.
The father nags the patient for being slow.

(Score 2-)

24. Parent pays no attention to child, gives no money, toys, or treats.
The father shows no interest in his children. He never takes them out or gives them pennies.

25. Parent spanks child, whips child.
(History gives no qualifying statements as to how severely or frequently.)
After sex misconduct, the child was whipped.
Her father does not whip or scold much, but her mother does.
The child has been spanked since he was eighteen months old.

26. Parent does not provide advantages, special education, etc.
When private school was suggested as a means of remedying Betty's school problem (it was within the means of the family), the mother said, "If I were going to spend all the money I would rather send her to camp. Then she would be away for the whole summer and I would get a rest. It would be awfully hard for me to have to take her to school every day."

27. Parent does not spend time with child.
The mother feels that she has not the time or the strength to do it right (discipline the patient).
Brother: He (father) was very studious. He did not like to be bothered with any of us, but wanted to study and read all the time. He was somewhat indifferent to us.
Neither parent wishes to spend any time to go with the children, but the mother sometimes will take the patient for a walk providing she insists strongly that she wants to do something.

28. Parent neglects child; child's movements unsupervised.
When the worker asked if the mother's concern might indicate a feeling that she had neglected the children, the father replied: "She hasn't realized that she has neglected them." But he changed this immediately to an emphatic statement to the effect that the mother had not neglected the children.
Miss...., principal of the school, thinks the mother's attitude is wrong, that she has too many activities, has too many parties to look after the children properly, and that she is away from home too much of the time.

29. Compares child unfavorably.
The father always cites O. as an example for the patient. He told the worker

that O. and patient are as different as Abel and Cain.

The parents compare child with another who does what they wish their own to do, as saying "Mary Coe can feed herself."

The parents suggest that some friend is doing better than the patient in his school work.

30. Parent is hard on child; holds him to standards which are not suited.

The father expects the patient to live up to adult standards.

The father is apt to be severe and say mean things and hand out, without discrimination, the punishment of staying in because of trivial misconduct.

The parents demand immediate obedience from the children.

31. Parent makes no exceptions; never gives in to child.

The mother states that she never changes her mind, but the boy does not seem to know this and has told her that sometime she might "slip up."

The father has insisted that the patient be whipped every time he has soiled his clothing.

If they fall down once in a subject, he wants to take them out immediately without giving them another chance.

32. Parent criticizes child.

The father is particularly worried because he thinks the boy is "yellow" and will not stand up for himself.

The mother says he has a "vile tongue" and often curses her with a maliciousness that is shocking.

The mother frankly stated that the boy was sissy.

His mother sometimes talks about the patient's conduct in presence of neighbors and tells how hard he is to manage.

33. Parent does not make an effort to improve child's condition--by consulting or coöperating with specialist (doctor, teacher, clinic, etc.), does not help with school work.

The father sees no reason why L. should not return to the clinic except that his wife does not want to be bothered. The mother has not kept appointments or brought L. to the clinic. The case was finally closed because of lack of coöperation from the mother.

Her mother has not called on teacher (as suggested at clinic), pleading lack of time. She did not have time to help the child with her reading.

(Score 3-)

34. Parent threatens to evict child.

She is always talking of drowning herself, to which the mother replies, "Go ahead and do it."

Prior to the visitor's call, his mother had frequently told him that she was going to tell Judge.....to have some one come and take him away.

35. Parent deliberately frightens child.

The only things of which L. is afraid are a dark room, worms, and snakes. Last Sunday, when she was misbehaving, her mother picked up a stick which resembled a snake and said: "If you are not good, I'll put this snake on you." L.'s lips became blue and she had an attack of hysterics. Her mother said: "I know I should not have played such a practical joke on her, I knew that she was terrified of snakes, but I didn't think it would have such an effect."

Within the last two years, she scared him by telling him that his conduct caused her heart trouble and she feigned a heart attack or dying spell. He would become very upset, cry, and try to do everything to revive her.

36. Parent locks child away in closet, basement, outside house.

His father used to lock the patient in a closet and refuse him food.

When things do not please her, she says, "I'm going to move." She screams and stamps her feet when she says this. Once when she had made this remark, her mother put her out of the door, locked it, and would not let her in until she said she was sorry.

He has locked her down cellar.

37. Parent wants to put child away in military, reform, boarding school, convent (for discipline, to avoid trouble).

His mother spoke of the advisability of placing the boy in some military boarding school where he would be entirely on his own with other boys and at the same time be away from home and the contact with adults which he has at the present time.

In discussing sending L. to the convent, Mrs. R. said that she felt that she did not have time to spend on the child's training, that she was not very well; she thinks that the calm discipline would be good for L.

Her father threatens to send her to a correctional institution.

38. Parent threatens to report child to authority.

The parent threatens to turn the child over to authority.

The father threatens to have the patient arrested.

Prior to the visitor's call, his mother had frequently told him that she was going to tell Judge.....to have some one come and take him away.

39. Parent reports child to an authority.

The patient is not a school problem. The only time he has been taken to the principal's office was at the mother's request when she complained about his staying away from home.

Twice when the patient came home at midnight, his father and brother O. took the patient to the police station. The patient was very much frightened.

The mother reported to the father (who habitually beat the patient brutally) that the patient had been skipping her violin lessons.

(Score 4-)

40. Parent sees mainly shortcomings.

The mother states that the father sees no good in the boy. The father admits his dislike of the boy every day.

The mother thinks the boy is unreasonable, domineering, forgetful, argumentative, and lacking in respect for rights of others.

His mother thinks he has "no depth of character"; he is not popular because of his "sassy" tongue.

The father cannot see one good quality in the patient.

She admits that Isabel has some good points, but does not mention them directly; she says she is selfish, lazy, careless.

41. Parent uses severe punishments.

On one occasion the mother had the patient kneel in a corner for three hours; he cried and begged to get up, but the effect soon wore off.

At another time, he (father) held his (patient's) hands over the fire to punish him.

He (father) has beaten patient so that she has been bruised all over.

He (father) loses his temper so that he is almost beside himself when he beats them.

She (mother) used to tie them to a table with a clothes line. He usually got several whippings, as he would scream until released.

42. Parent deserts child.

The father deserted the family. He said he was going to collect money from his parishioners. Later the mother found he had gone on the train. He had planned secretly to leave them. He wrote back telling merchants not to give the mother any articles in his name. He writes to the family about once a month; he has made no attempt to see the family in nine years. He has sent small sums of money several times. (He is a carpenter by trade now.)

43. Parent evicts child.

Her stepfather drove her out of the house, saying she could earn her own living. She has been doing housework ever since she was fifteen.

44. Parent turns child over to an authority.

Mr. O. (foster father and half-brother) had the patient arrested and temporarily committed to the Detention Home (because of continual truancy).

The father had the patient arrested (because of theft and truancy) and allowed the case to be brought to trial.

45. Parent puts child in military, reform, boarding school, convent (for discipline or to avoid trouble).

46. Parent does not provide financial support.

The father provided the family with a very poor home and debts.

The father deserted the family, planned secretly to leave them. He wrote back telling merchants not to give the mother any articles in his name. He writes to the family about once a month; he has made no attempt to see the family in nine years. He has sent small sums of money ($5.00 or $10.00) several times.

KEY POINTS
(Score +)

a. Parent is affectionate with child.

The mother picked up the younger brother, kissed him with intensity, and put him down.

The mother beamed with delight as A. entered. She patted her on the head and stroked her curls as she proudly introduced her to the worker.

b. Child likes to help parent.

Ernest helped his mother considerably about the house always in a cheerful, willing spirit.

Her three wishes bring out a special interest in fairy tales, ...dolly, buggy,

and a desire to have a pretty home for her mother.

His brother has always worked after school Saturday and Sunday and during vacations. His salary supplemented his mother's earnings. His average grade was A. He is interested in athletics but is unable to take an active part because of lack of time for practice.

c. Child likes to be with parent.

She (patient) seldom does anything alone, but likes to help her mother, probably because she wants to have company rather than because she is interested.

He will sit by the hour while his father reads to him.

Whenever he (father) is away, she (patient) hangs on to him when he returns and likes to be with him on Sundays, going with him to the garage and on errands about the neighborhood. She always likes to go to the store with him.

d. Child is said to be parent's favorite.

The mother preferred E. (patient).

The patient has always been his favorite of the two children.

He (patient) admits that there is definite partiality shown between the two, he being the favorite.

e. Parent tries to answer child's sex questions.

There has always been perfect frankness between mother and son on subject of sex.

The mother has attempted to give him sex information.

f. Child asks parent questions freely.

His mother thinks he is an unusually clean-minded boy because he always comes and tells her about any "dirty" things he sees or hears. (His sister has a sex problem.)

"John is not ashamed" to talk freely to his mother (about all the sex information he had been given by his companions).

g. Parent is pleased that child resembles him.

He (father) sees his own childhood in Janet. He was always in mischief and saucy, and his mother was always thrashing, though it was often for things that were not his fault. "I lost my temper very easily but I outgrew all that."

Two or three different times, the father commented that O. was much more like him, while John (patient) was like his mother. (O. was not a problem.)

(Score -)

h. Parent discriminates against child.

The mother and stepfather both state that the latter is partial to the patient's sister.

He (father) has never permitted any freedom of social intercourse in the family until the last three months, when he has allowed the eldest daughter to have some friends.

i. Parent is antagonistic to or hates child.

Because of his (father's) antagonism and terrible temper....(towards patient).

I (father) hate S. (patient) because he causes me so much trouble and we are all ashamed of him.

j. Child is antagonistic to or hates parent.

"I hate him. He never says a kind word to me," Evelyn said of her father.

Her expression, an exact duplication of the one the mother uses in connection with her husband's attitude, makes one suspect that possibly the child has overheard her mother's statement about her husband.

His mother says he (patient) often curses her (mother) with a maliciousness that is shocking.

k. Parent is not affectionate with child.

May is very demonstrative in affection and remarks on her father's lack of interest in children. The mother herself is not given to much show of affection but says she always responds when the child asks for it.

Mr. M. has a marked fondness for his own son but shows no affection for his stepchildren (patient).

l. Parent does not kiss, caress, and fondle child.

He has been somewhat hurt by mother's refusal to kiss him when he goes out, or by her refusal to hear him say his prayers, but on the whole, nothing makes a lasting impression.

Evelyn throws her arms around my neck and nearly chokes me. I can't throw her off. I put her down and tell her she hurts me.

The mother held the child suspended by one arm as she left the elevator, plunked her down on the floor, and gave her a little push.

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PATH-SELECTION BEHAVIOR OF YOUNG CHILDREN IN BODY-MAZES

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In preliminary experiments with eight subjects, the feasibility of planning maze studies with children as young as two years of age was rather clearly demonstrated. Moreover, it was discovered that the subjects seemed to be forming path-selection habits in one trial in a pattern which offered more than one choice of paths. That they were true habits seemed to be indicated by the fact that they persisted through successive trials and over a period of non-activity.

The present study has for its purpose a further investigation of this phenomenon, making use of a greater number of subjects and additional maze patterns. Accordingly, the following specific questions were asked: (1) Is it actually practicable to plan maze studies with young children? (2) Do young children rapidly establish path-selection habits in mazes which offer more than one path to the exit, or are they variable in their path-selection behavior? (3) What factors show relationship to maze path-selection behavior?

A review of the literature on the subject of learning in young children (17) discloses the fact that the body-maze, in spite of its extensive use in the field of comparative psychology, has been used in only four investigations with young human subjects. Hicks and Carr (10) as early as 1916 used five blind-folded children eight to thirteen years of age in a comparative study with adult humans and rats. The maze for the human subjects consisted of wires stretched to form paths and culs-de-sac. In 1920 Dashiell (4) used eight five-year-old children in a study of complete versus alternate methods of learning two maze patterns. The maze construction employed was described by Stetson and Dashiell (14); it closely resembles the one used in the present investigation. More recently Gellerman (8) has used a few young children in studying the double alternation problem with humans. He was unsuccessful in building up the habit with two subjects below the age of five years. Davis and Batalla (6) have quite recently described an outdoor body-maze for children, which has been used in an extensive piece of work just reported by Batalla (1). The data collected, however, have been analyzed with regard for manifestations of "insight", the findings concerning habit formation being largely untreated. The work very clearly demonstrates the feasibility of planning certain types of maze studies with children as young as thirty months of age. It also indicates that children, when introduced to two short and one long path, eliminate the long one and choose one of the two short and equidistant paths. The data do not state the number of trials necessary to build up a path-selection habit, hence it cannot be compared with that presented herein.

Few comparable studies have been found using animals. Buytendijk (3) investigated the acquisition of habits in birds using a quadruple choice situation similar to the one herein described. Schut (11) repeated and extended his observations. They found that their subjects very rapidly built up habits of selection which persisted, often without error, and also that these habits could rapidly be altered when the food-compartment was changed. As the work was not quantitative nor the description precise, no direct comparison of results is possible. The impression is given, however, that some birds evidence learning in one trial in this type of situation.

1. The writer wishes to acknowledge the valuable assistance of Dr. Orvis C. Irwin, director of this study.

Although large broken field mazes have been used extensively by Shepard (12), the work of Dashiell (5) on direction orientation is more similar to the present study. In a small broken field pattern offering twenty possible paths to the exit, he found rats selecting the center and more direct paths oftener than those along the sides of the enclosure. In fifty trials, two each day, he did not find them forming a one-path habit. Dashiell suggests a "forward-going tendency" as a probable explanation for what he had previously termed "direction orientation." The evidence for assuming this tendency to be operative has recently been strengthened by Bayroff (2).

Using a similar though larger maze, Gengerelli (9) found that rats soon drop the forward-going direction when the result is a longer path to the food box, and adopt a diagonal short cut. He suggests the principle of minimal behavior as an explanation. The same phenomenon is considered under Wheeler's (16) "law of least action." Of interest is the fact that Gengerelli's rats, unlike those used by Dashiell, formed what appear to be path habits in an experimental period of nine trials. It would seem that the number of trials per day was the differentiating factor in these two experiments. Of further interest are Gengerelli's findings concerning motivation. With subjects who had been allowed to eat to the point of satiation, no constant path or direction of behavior was found. Rather, the rats indulged in random exploration.

Although these studies present little data which can be termed comparable to the findings of the present study, their results are suggestive in interpreting the findings herein described.

APPARATUS

During the course of the investigation three experiments involving three maze patterns were carried out. The patterns used were (1) a small broken field maze referred to as pattern BF; (2) a quadruple choice maze, pattern QC; and (3) a triple choice maze, pattern TC.

The maze itself was a multiple-unit system consisting of frames 4 feet square constructed of 1 1/2 inch blind stock and covered with unbleached muslin. Through the bottom of each frame, 1 foot from either end, were driven two nails by means of which the units were held stationary in 1/8 inch holes bored in the floor. Patterns could be changed by the boring of additional holes. At the top the units were fastened by means of large paper clamps to five parallel wires spaced 2 feet apart. These wires, 14 feet in length, were fastened at one end to the wall of the room, and at the other to a solidly braced framework. The maze proper was thus limited to a space of 8 feet by 14 feet. The ends were covered with the same material as was used on the units.

The experimental room was 12 feet in width, thus allowing for a 2-foot space on either side of the maze which might be said to correspond to a starting and finishing "box." Fastened above the solid framework forming the one end of the maze was a screen 2 feet by 8 feet constructed of common door screening given two coats of white enamel and backed by three layers of black cheesecloth. All observations were made through this screen. One indirect lighting fixture in the center of the ceiling containing a 150 watt bulb furnished the only light during experimentation. All doors were closed and blinds for the two windows drawn at all times.

Figure 1 on the following page shows the experimental room and pattern BF in position. It will be seen that all pathways were 2 feet in width and that ten possible paths to the exit were present, paths A4 and 1C involving the least possible number of turns. All paths were approximately equal in length.

EXPERIMENT WITH THE BROKEN FIELD MAZE

The subjects for this experiment were twenty-five children from the preschool laboratories of the Iowa Child Welfare Research Station. The mental age range was from two years, two months to five years, ten months; the chronological age range was from one year, eleven months to four years, three months. Mental ages were derived by means of the Kuhlmann-Binet scale with the exception

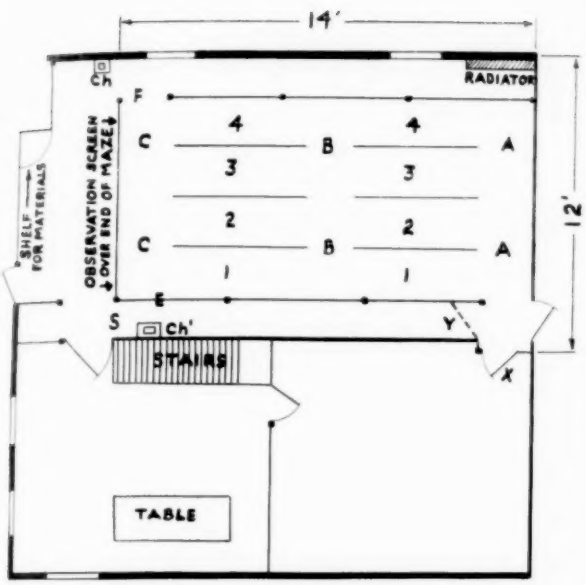

Figure 1. Experimental room for experiments BF and QC. Maze pattern BF in position.

■	junction of image units	Y	position of blocking unit during blocked trials
A,B,C,1,2,3,4	paths		
S	start	X	start of blocked trials
F	finish		
Ch	chair on which stimulus-object was placed	E	unit removed during blocked trials
Ch'	position of chair for blocked trials		

of three of the older children who were given the Stanford-Binet test. All tests had been given within a period of three months from the time of the experiment. Mental ages were corrected to the date of the experiment.

Seven of the subjects had had previous maz. experience, having been used in the preliminary work. For them the procedure followed the course taken earlier. The child was obtained from the laboratory play group located adjacent to the experimental building and conducted to the "starting box" by the assistant, who immediately stepped behind the observation screen. The experimenter drew on previously prepared blanks the pattern of the path taken by the child, noting time, verbalizations, and other reactions. The stimulus-object was a small toy chosen at random by the experimenter from a collection of balls, iron trucks, dogs, etc. The toy was placed in the Skeels Conditioning Form Board (13), always under the square.[1] The experimental hours were from 9 A.M. to 11:30 A.M.

After obtaining the toy, the subject was taken to the next room by the assistant, where the toys were deposited on a window sill or table. After the experimenter had inserted a new toy, the words "all ready" were usually sufficient to bring the child on the run and start him without further aid on the trip through the maze. If engrossed in play, sometimes it was necessary to take him by the hand and tell him to "find another toy."

During the preliminary work ten trials were usually given at an experimental period, since it was found that soon after that time the child began to show signs of disinterest unless additional stimulation of some sort was supplied. Accordingly, ten trials were used in the early periods of this experiment until it became apparent that no child who chose the same path during the first five trials varied his behavior during the last five. Therefore, behavior on five trials was deemed indicative of that over a greater number of trials and was used during the remainder of the experiment. If variability of behavior appeared during the first five trials, ten trials were required.

Since small china dogs appeared to be the most popular toy in the assortment, and also possessed the advantageous feature of reducing play between trials and keeping the interval more nearly constant, they were used as stimulus-objects with the inexperienced subjects. The child was brought to the adjoining room, shown five small empty boxes and one toy dog, and told that the game was to find the dogs for the boxes. The subject, as he stood at the entrance to the "starting box", was then allowed to see the dog placed on a chair at the opposite side of the room. On the first trial only, he was conducted to the actual entrance of the maze and told to "find the dog."

Retests were given one week later to twenty-one of the twenty-five subjects.

1. The data concerning learning on the form board are not considered in this study.

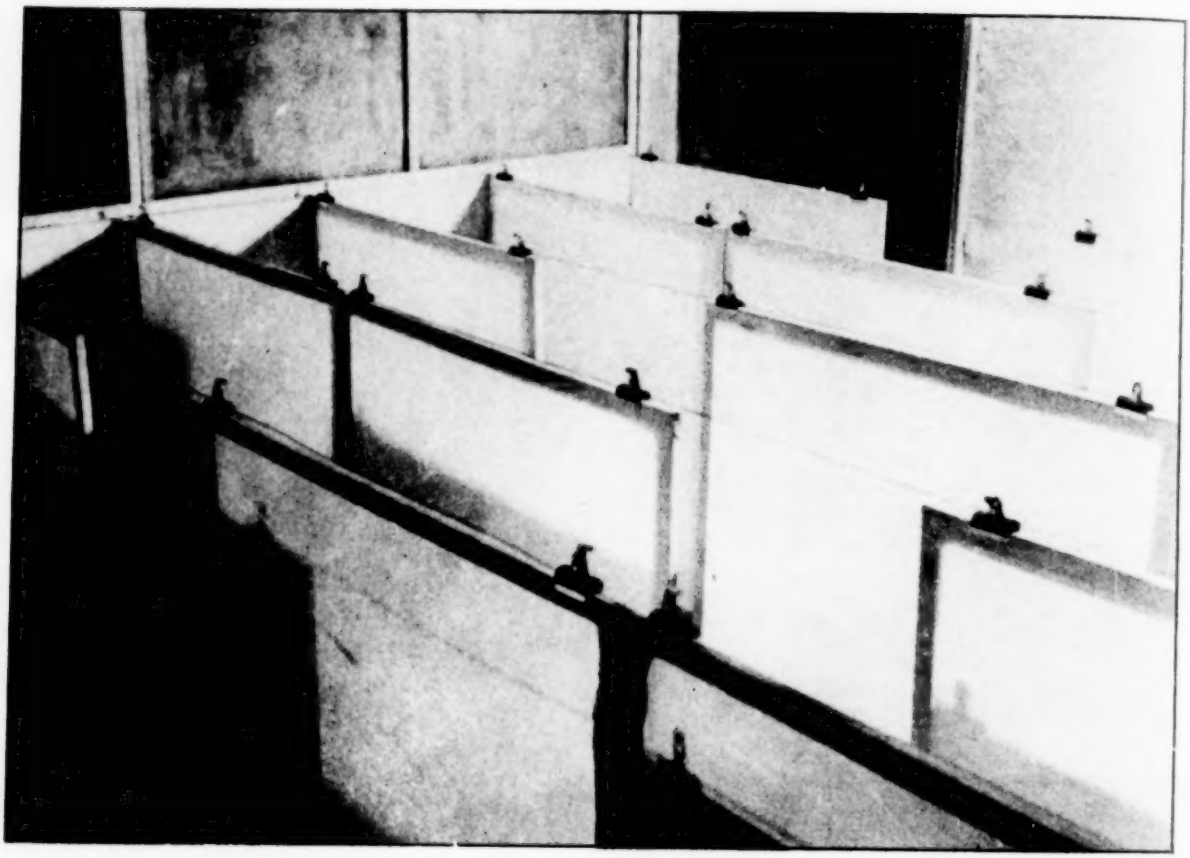

Figure 2. Maze set for one of the preliminary patterns.

Occasionally subjects were not available at that time, but the majority were tested on the seventh day. In order to determine whether the subjects would react as if to a new situation or would continue in the path previously taken, the exit was blocked and a new one opened. With eleven of the subjects blocked trials were run immediately after the retest, both dogs and other toys being used. From the number of subjects who had already had retests, it was possible to obtain seven for the blocked trials.

For these blocked trials the child was conducted the first time to the start of the maze proper through door X (Figure 1), the original starting box being blocked at Y with one of the maze units. The previous exit was blocked with a unit 2 feet in width and unit E was removed, thus making possible a short cut through path 1 directly to the toy, now placed on a chair outside the new exit. By looking down path 1 from the entrance of the maze it was possible to note that unit E had been removed, but the chair and toy were not visible. As selection of the new path involved a radical change in behavior, a criterion of three out of four trials was considered sufficient to indicate the child's perception of the nature of the change.

RESULTS AND DISCUSSION OF EXPERIMENT WITH PATTERN BF

Constant Path-Selection Behavior

The path-selection behavior of the subjects used in this experiment is shown in the tabulation on the following page.

	Subjects Showing Constant Behavior	Subjects Showing Variable Behavior	Total
Test	16	9	25
Retest	13	8	21

It will be seen that sixteen subjects manifested a type of behavior which is described as constant and nine reacted in a variable manner in their selection of paths. Constant path-selection behavior is defined as the recurrent use of one path beginning not later than the fourth trial of a test. This allows for variability of selection on the first three trials only of an experimental period and regards them as possible learning trials.

If a constant subject altered his path on the retest after the first trial, he was classed as variable. The classification of a variable subject from the test was not changed regardless of his retest path behavior. According to this definition, 64 per cent of the subjects were constant in behavior and 36 per cent, variable.

On the first test, path A4 was selected by eleven of the sixteen constant subjects, path 1C by three, and paths A3B4 and 1B4 by one each. On the retest thirteen of the sixteen constant subjects were used, twelve of whom selected the same paths used during the first test. Only one subject changed his path, selecting path 1C 80 per cent of the trials on the first test and path A4 80 per cent of the trials on the retest. Thus 92 per cent of the retested constant subjects evidenced the same path-selection behavior after a period of one week.

If persistence of a certain type of behavior over a period of time indicates habit formation, the sixteen constant subjects may be said to have rapidly set up path-selection habits in this maze pattern: eleven, or 69 per cent, in one trial; four in two trials; and one in four trials. The five subjects requiring more than one trial are not significantly younger in mental and chronological age than those requiring one trial, although two of them were among the youngest subjects used. Since they were inexperienced subjects, variations in comprehension of instructions is possibly accountable.

Although the analysis of sensory cues responsible for this type of learning was not a specific object of this study, protocols on the behavior of the subjects throw some light on the problem. Of the four possible types of cues--visual, kinaesthetic, auditory, and tactual--the first seems to be the most effective and the latter two the least effective if at all operative, while little can be said concerning kinaesthesis. Auditory cues are believed unlikely since any audible noises were entirely incidental in character and thus not constant. Possible operation of auditory floor cues is questioned since (1) locomotion in the maze was characterized at times by running and at other times by walking, skipping, or scraping of feet; and (2) foot-covering of the subjects was not constant from test to retest. Tactual cues seem impossible since the subjects seldom touched the maze units and since the flooring was uniform. Although kinaesthesis may afford cues which might operate, it is questionable whether they could be effective in setting up a habit in one trial. The operation of vision, however, can be observed: (1) The subject's first trip through the maze was characterized by hesitation and much visual exploration. (2) Visual exploration decreased from trial to trial. (3) On subsequent trials, occasionally impetus carried a child past his usual path, whereupon the usual reaction was hesitation, visual exploration, retracing to the point of "wrong" choice, and selection of the previously taken path.[1] It must be assumed, therefore, that the habit is formed largely in visual terms, although other factors may possibly be operative.

Although the predominant selection of path A4 cannot be explained from the data at hand, it seems possible that both it and the selection of path 1C are manifestations of the "forward-going tendency" found by Dashiell (5) and Bayroff (2) in rats. If it was the only factor operating, however, all subjects would take path A4 the majority of the trials. As six of the seven experienced subjects' paths through the center of

1. In a few cases where retracing did not here occur, variability of path-selection resulted. The fact that variable subjects at times also manifested this hesitating and retracing behavior is further evidence that the general response is to a definite path.

TABLE I

PATH-SELECTIONS OF VARIABLE SUBJECTS

	Experienced Subjects					Inexperienced Subjects			
Trial	F797	M799	F802	F801	M805	F838	M713	F722	F693
1	1B2C3B4	1B4	A3B1C	A3C	A2B3C	1B4	1B3C	A2B1C	A3B4
2	1C	1B2C	1B3C	A3B4	A2B3C	A3B4	1B3C	A2B3C	A3B4
3	1B3C	1B2C	1B4	A3C	1B3C	A3B4	1B3C	1B2C	A2B4
4	1B2C	1B2C	1B4	A32C	1B2C	A2B3C	1B2C	1B4	A2B4
5	1B3C	1B2C	1B4	A1C	1B2C	1B2C	A2B3C	A2B4	A2B4
6	1B2C	1B2C	A3C1B3C	A2C	1B2C	A2C	1B3C	A4	A4
7	1B4	1B2C	A2B4	A4	1B2C	1B2C	1B4	1B4	A4
8	1B4	1B2C	A4	1C	1B2C	1B2C	1B2C	1C	A4
9	1B3C	1B2C	1B4	A3C	1B3C	1B2C	1C	1B2C	A4
10	1B3C	A2B3C	A4	A3B4	1B2C	A2B3C	1B2C	A4	A4
11	1B3C	1B2C	1B4	A2B4	A3B4	A2C	A3C	A4	
12	1B3C	1B2C	A4	A4	A3B4	1B2C	1C	A4	
13	1B3C	1B2C	A3B4	A3B4	A3B4	1B2C	1C	A3B4	
14	1B3C	1B2C	A3B4	A2B4	A3B4	1B2C	1C	1B4	
15	1B3C	1C	A2B4	A3B4	A2B34	1B2C	1C	A4	
16		1C	1B4	A3B4	A3B4				
17		1B2C	1B4	A3B4	A3B4				
18		1B2C	1B4	A3B4	A3B4				
19		1B2C	1B4	A3B4	A3B4				
20		1B2C	1B4	A3B4	A3B4				

the maze, selection would seem to be explainable in these cases in terms of the previous maze patterns traversed, all of which required variations of that general direction of reaction. Further research in larger mazes is needed to answer the question.

Variable Path-Selection Behavior

Nine, or 36 per cent, of the subjects evidenced variable selection of paths from trial to trial. Table I presents the paths selected on test and retest.

It will be seen that, with the exception of subject F722, the tendency is clearly present to select one path more often than others in spite of variability. If the paths taken are studied with Figure 1, it will also be noted that quite often they are similar in direction though not identical. For example, trial 10 of subject M799 represents the identical pattern of path 1B2C which was taken on the previous trials, but it is one path deeper in the maze. This instance seems to have been the result of impetus carrying the subject past the usual path, plus reaction to the old pattern. Further study shows that this subject really manifests constant behavior with the exception of trials 15 and 16.

Comparison of Constant and Variable Subjects

In attempting to account for variability in maze behavior, it should be borne in mind that the data include only nine variable cases. Consequently, although the factors determining variability may be indicated, analysis of their relative importance is impossible. The six possible factors which will be considered are mental and chronological age, previous maze experience, type of path selection, greatest speed evidenced in maze, constancy of running time, and impetus.

In making age comparisons, the data of the seven experienced subjects have been separated from those of the eighteen inexperienced subjects. Five of the former, or 71 per cent, manifested variable behavior, while two of them selected identical paths on all trials. The mental age range of the variable subjects was from three years, five months to four years, seven months and the chronological age range was from two years, five months to two years, nine months. No subject younger than the lower limit of this range was variable. The two constant subjects represented mental age values of two years, two months and three

years, one month and chronological age values of one year, eleven months and two years, three months. As no overlapping in either mental or chronological age was present, these variable subjects were older.

Of the eighteen inexperienced subjects, only four, or 22 per cent, were variable. Their mental age range was from four years, eight months to five years, ten months and their chronological age range was from three years, six months to four years, one month. The fourteen constant inexperienced subjects ranged in mental age from two years, two months to five years, five months and in chronological age from two years, six months to four years, three months. As overlapping of mental age was present in only four cases out of eighteen and in only three cases out of eighteen in chronological age, the variable subjects are again seen to be older than the constant subjects.

When all variable subjects are compared with all constant subjects, mental and chronological age differences[1] are found as indicated in the following tabulation:

Age	Subjects Showing Constant Behavior		Subjects Showing Variable Behavior		n	t	P
	Mean	S.D.	Mean	S.D.			
Chronological	2.88	.70	3.11	.63	25	1.885	Between .1 and .05
Mental	3.60	1.05	4.34	.84	25	4.154	Less than .01

The above figures show that the variable subjects were significantly older in mental age than the constant subjects, and that the difference in chronological age approaches statistical significance. Thus all comparisons indicate that the older children were more likely to be variable than the younger ones. It is of further interest that no subject below a mental age of three years, five months or a chronological age of two years, five months evidenced variability.

When the frequency of variability of the inexperienced and experienced subjects is compared, it will be seen from the preceding paragraphs that 71 per cent of the experienced subjects were variable and only 22 per cent of the inexperienced subjects manifested variability. Previous maze experience would seem to be an operating factor.

It has already been pointed out that previous maze experience probably determined selection of center maze paths by the experienced subjects. Table I indicates that all of the nine variable subjects took center routes through the maze on the first trial. Since only two of the constant subjects used center routes consistently (five used them on the first trial) and since inspection of the maze diagram shows that a greater number of choice junctions would be encountered by subjects selecting center paths, it would seem possible that variable path-selection behavior may be a result of center path-selection.

As it seemed possible that variability was also a function of actual time spent in the maze, several time values were compared. Calculations using time values are in terms of excess time above the least time on any trial plus two seconds. This procedure has been followed since speed in the maze depends not only upon motivation but upon individual locomotor characteristics. Some children usually walk while others run, although by the consistency of their time records and by their facial and vocal manifestations of interest, motivation could not be judged as greatly different. It is assumed for the purposes of the present study that optimal motivation is represented by the trial or trials requiring the least time, and that motivation for any trial has been relatively adequate if the time required is not excessive of two seconds over the least time recorded.

When comparison is made between the mean least time values for the variable and constant groups, it is seen from the tabulation on the following page that the variable subjects evidenced a greater mean least time. The difference, however, only approaches significance. A significant difference does show up when the per cent of trials after learning which contain excess time is compared

1. In view of the small numbers in the groups to be compared, Fisher's formula (7, p. 107) for the significance of difference in means of small samples has been employed rather than other more widely used techniques. The derived ratio of the difference to the standard error of the difference is t; P is the probability value. When P is .05 or less, the difference in the means is considered significant.

	Subjects Showing Constant Behavior		Subjects Showing Variable Behavior		n	t	P
	Mean	S.D.	Mean	S.D.			
Least time	4.94	1.20	5.33	.71	25	2.057	Between .1 and .05
Per cent of trials after learning containing excess time	13.01	15.13	25.37	21.24	25	3.886	Less than .01

for the two groups. Learning trials are considered as being those which manifest a steady decrease in time; trials which are no longer decreasing in time are considered as "trials after learning." It is appreciated that this concept would be open to criticism in difficult maze patterns, but it is believed valid for simple learning problems. Per cent of trials was necessarily used rather than number of trials or total excess time, since the number of trials per subject was not kept constant. The variable group is found to show a significantly greater mean per cent of trials containing excess time. The statistical treatment, however, does not indicate whether the excess time is a result of inadequate motivation or of variability itself. Qualitative treatment is needed, therefore.

It has already been pointed out that five of the variable subjects had had previous maze experience; three of them evidenced no excess time. Of the four variable and inexperienced subjects, two showed no excess time. It follows that variability is not necessarily the cause of excess time. It can only be stated, therefore, that variability of four subjects may possibly be explained in terms of excess time resulting from inadequate motivation, and employed in circumspection and exploration. This agrees with the findings of Gengerelli (9) which show that satiated rats do not set up path habits, but instead are variable in their behavior.

The variable behavior of the other five subjects must be considered the effect of other factors, such as comprehension of the nature of the situation with rapid exploratory selection of different paths, or general direction orientation to the exclusion of definite path or pattern orientation. Variability as a possible result of impetus has already been noted.

Of further interest is the data of Table II, page 206, and the time curves of Figure 3, page 205, based upon that data. The curves of both variable groups are seen to start lower, fluctuate more, and end higher than that of the constant inexperienced group.[1] Since it has already been pointed out that variability in five subjects is not related to excess time, it follows that the higher time curves of the variable subjects are the result of those four subjects who were inadequately motivated. It is also apparent that the variable subjects adjusted much more rapidly to the situation. This fact argues for a quicker comprehension of the problem. The drop, however, is seen to be rather abrupt for all subjects.

Relation of Time Values to Mental and Chronological Age

To determine whether time values in general bear any possible relationship to mental and chronological ages, certain correlation coefficients were calculated. The Pearson product-moment formula was generally used throughout this and the two following experiments for, although but few cases were considered, the ranges were often too wide or the values too frequently of the same rank to render results obtained by the method of rank difference other than spurious. In a few instances, the technique of partial correlation has also been employed with the hope of showing up factors of possible importance. It is appreciated that its

1. Rather than form a group of only two subjects, the two constant experienced subjects are not included in this treatment.

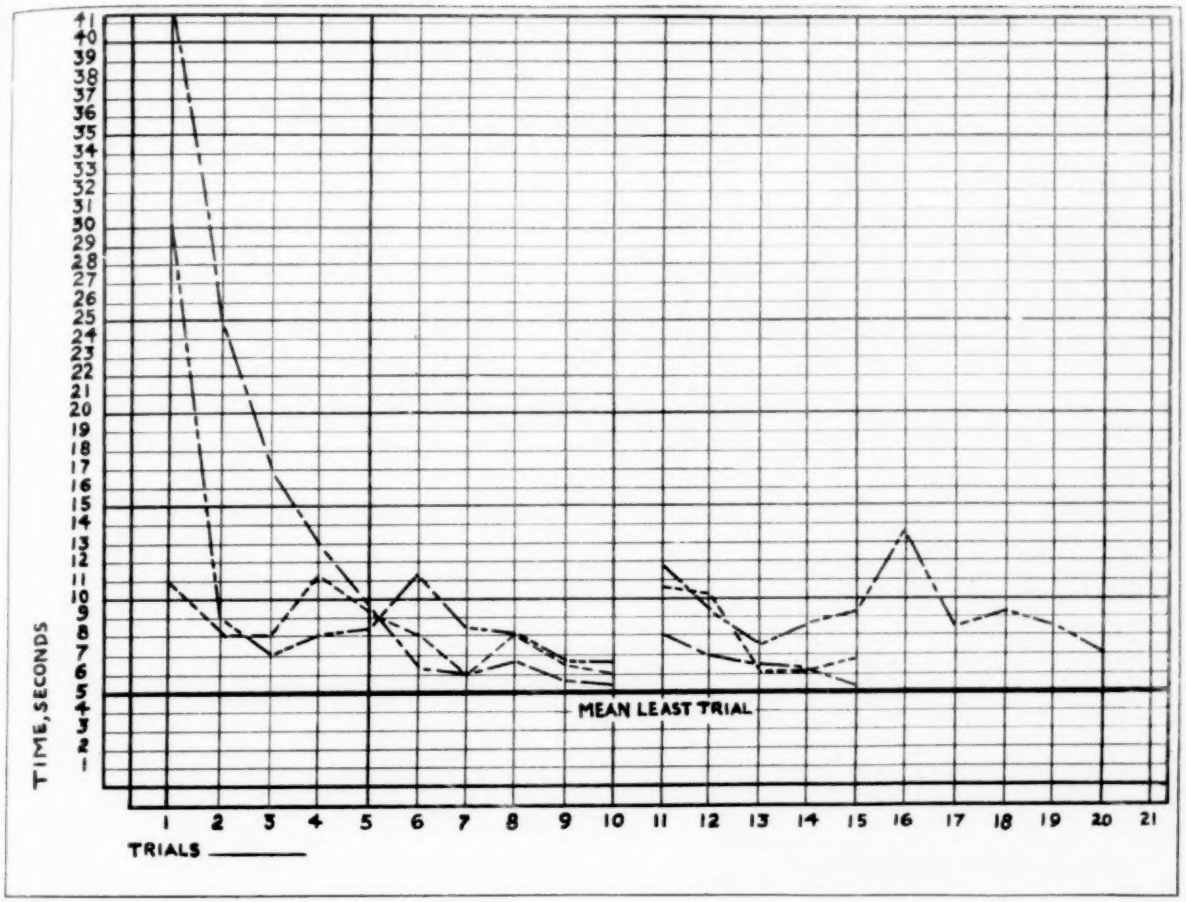

Figure 3. Time curves, experiment BF.

— — — — Inexperienced, variable subjects
——— — ——— Inexperienced, constant subjects
——— — — — ——— Experienced, variable subjects

use is seriously questioned when the cases are so few in number.[1]

Although some of the coefficients obtained may perhaps be considered as statistically significant, it must be remembered that in addition to the small number of cases many uncontrollable factors have entered into the final results, chief of which probably are changes in motivation. By change in motivation is not meant change of incentive, reward, goal, or stimulus-object, but rather change in the effect of the sum total of stimuli impinging upon the sense organs of the organism and resulting in an altered response to the stimulus-object or situation. Most factors in maze studies offer themselves to control, but not until a means has been discovered of measuring and maintaining relative constancy of motivation will correlation coefficients concerning learning studies with children be of greater than suggestive value.

1. Fisher's table (7, p. 176) for different levels of significance of correlation coefficients when the samples are small has been employed throughout. Values of P not in excess of .05 indicate the correlation may be regarded as significant.

TABLE II

TIME RECORDS FOR THE BROKEN FIELD MAZE

Trial	Experienced Variable Subjects		Inexperienced Variable Subjects		Inexperienced Constant Subjects	
	Mean	Range	Mean	Range	Mean	Range
			Test			
1	30.8	9.0 to 110.0	10.5	7.0 to 14.0	41.5	5.0 to 137.0
2	8.8	7.5 to 12.5	8.1	5.0 to 10.0	25.5	4.5 to 110.0
3	7.2	6.0 to 8.5	8.0	6.0 to 10.0	15.9	5.0 to 65.0
4	8.0	6.0 to 11.0	10.7	5.0 to 26.0	12.4	5.0 to 39.0
5	8.2	6.5 to 12.0	9.5	5.0 to 17.0	9.7	4.0 to 35.0
6	10.8	6.0 to 19.0	8.0	5.0 to 14.0	6.3	4.0 to 9.0
7	8.6	7.0 to 13.5	6.2	4.5 to 10.0	6.2	5.0 to 11.0
8	8.2	7.5 to 10.0	8.1	5.0 to 13.5	6.5	4.0 to 10.0
9	6.9	6.0 to 8.0	6.9	4.5 to 12.0	5.6	3.0 to 8.0
10	6.9	6.0 to 8.0	6.5	5.0 to 11.0	5.4	4.0 to 10.0
			Retest			
11	11.8	7.0 to 20.0	10.8	7.0 to 16.5	7.6	5.0 to 12.0
12	9.4	6.0 to 13.0	10.0	4.0 to 17.0	6.5	4.0 to 16.0
13	7.7	5.5 to 11.0	5.8	5.0 to 6.5	6.1	5.0 to 10.0
14	8.5	6.0 to 16.0	5.7	5.0 to 6.0	5.8	3.5 to 9.0
15	8.7	7.0 to 9.0	6.3	5.0 to 8.0	5.1	3.5 to 6.0
16	13.5	6.0 to 30.0				
17	8.2	5.0 to 15.0				
18	8.6	6.0 to 11.5				
19	8.2	6.0 to 13.0				
20	7.1	6.0 to 8.0				

TABLE III

COEFFICIENTS OF CORRELATION FOR TIME VALUES IN THE BROKEN FIELD MAZE

Time Value	n	Mental Age		Chronological Age	
		r	P	r	P
Least time	25	-.31	Greater than .1	-.33	Greater than .1
Excess time first trial (old subjects)	8	-.03	Greater than .1	.10	Greater than .1
Excess time first trial (new subjects)	17	-.52	Between .05 and .02	-.49	.05
Excess time first trial retest	21	-.14	Greater than .1	-.32	Greater than .1
Mean excess time	25	-.01	Greater than .1	-.15	Greater than .1
Per cent trials after learning containing excess time	25	.19	Greater than .1	.18	Greater than .1

Table III shows these correlations with their P values. It will be seen that all are insignificant except those related to excess time on first trial for the inexperienced subjects. Partial correlation was used in the two combinations where both correlations were high. Although both mental age and chronological age were held constant, in each case a lowering of the correlations resulted. On the basis of these correlation coefficients, time spent in the maze bears little relation to mental or chronological age except on first trial with untrained subjects, where it is shown that the older subjects possibly adjust more rapidly.

There is another way of showing whether this finding is valid. By inspection of the

following tabubulation it can be seen that five subjects of the constant inexperienced group having the youngest mental and chronological ages, when compared with the five oldest subjects, show greater mean least time values and greater mean excess time on first and second trials of the first test.

	Five Youngest Constant Inexperienced Subjects		Five Oldest Constant Inexperienced Subjects		n	t	P
	Mean	S.D.	Mean	S.D.			
Least time	5.2	.63	4.8	1.07	10	.6446	Greater than .1
Excess time first trial	23.5	21.88	4.0	4.06	9	1.5506	Greater than .1
Excess time second trial	16.6	21.37	0.9	1.8	10	1.4643	Greater than .1
Excess time first trial retest	2.0	2.10	1.0	1.22	9	.7446	Greater than .1

Any differences on the first trial of the retest are less apparent. When the P values of these differences are determined, however, they are all statistically without significance. It would seem then that even among subjects who evidence similar maze behavior and who have had the same type of training excess time and speed bear little relationship to mental and chronological age. The small size and range of the group not only prohibits further analysis, but also suggests the need of further experimentation.

Behavior on Blocked Trials

When the blocked trials are considered, the eight subjects who failed to shorten the maze distance by taking the new direct route over path 1 may be compared with the seven subjects who took the new route after from one to five trials. For the latter group, correlation coefficients were determined between number of trials required and mental and chronological ages. The correlation with mental age, -.24, showed no relationship. The correlation with chronological age, -.65, was higher though also insignificant.

If age was an important factor, a significant difference might be expected between the group which shortened the distance and the group which continued in their former path habit. This was not the case, however. It will be seen by inspection of the following tabulation that when the mean chronological ages and mental ages are compared, insignificant differences are found between both. Mean difference in least time is also negligible.

	Seven Subjects Who Shortened Distance		Eight Subjects Who Failed to Shorten Distance	
	Mean	Range	Mean	Range
Mental age	4.8	2.75 to 5.08	4.2	2.50 to 5.93
Chronological age	5.2	2.58 to 4.08	3.2	2.25 to 4.25
Least time	4.8	3.50 to 6.00	4.9	3.00 to 8.00

When per cent of trials after learning containing excess time is compared for the two groups, it is seen that the group which shortened the distance has a higher mean. The difference, however, is statistically insignificant. This is shown in the tabulation given on the following page. Relative differences in motivation do not seem to be influential. Differences in mean excess time on the first blocked trial are also insignificant.

When this same excess time value is correlated with mental age for all subjects, an insignificant correlation of .26 is found. Correlations with chronological age show a slightly higher value (.41) which, however, is not statistically significant as P is greater than .1. Evidently other factors than mental or chronological age determine speed of adjustment in this situation.

Other factors which might account for the different types of behavior were also considered. Of the two subjects having previous experience, one shortened the

	Seven Subjects Who Shortened Distance		Eight Subjects Who Failed to Shorten Distance		n	t	P
	Mean	S.D.	Mean	S.D.			
Per cent of trials containing excess time	24.0	23.77	16.4	17.52	15	.6614	Greater than .1
Excess time first blocked trial	8.4	4.58	11.3	9.70	15	.6738	Greater than .1
Excess distance first blocked trial	16.7	16.10	1.25	3.31	15	2.4686	Between .05 and .02

route and the other failed. Both had been variable subjects in the earlier tests. In the case of inexperienced subjects, variability cannot be said to influence response, for of the three who had been variable, two shortened the route and one failed. Nor can importance be attributed to the fact that seven of the subjects were blocked immediately after the retest, while eight were blocked during a third test at varying intervals after being retested. Four of each group failed to shorten the route.

One surprising result is that four of the constant subjects of the previous trials shortened their routes, two of them requiring but one trial to make the adjustment. The only explanation for this finding seems to be in terms of excess distance.

In order to determine excess distance on the first blocked trial, a small piece of transparent celluloid was ruled with ink into 8 mm. squares. This device, when placed over the diagram on which path recordings were made, gave an approximate measure of distance traveled in terms of equal units. Excess distance for the present experiment is defined as the number of units covered in excess of four from the point at which the former exit was blocked, four units being required to reach the new exit.

When excess distance on the first blocked trial was compared for the two groups, a difference is found. With one exception, the subjects who failed to shorten showed zero excess distance. Their behavior consisted of pushing at the blocking unit, vocalization ("I can't find it," "I can't get out," etc.), turning around, seeing the exit, and going to it immediately. Of the seven subjects who shortened the route, five showed excess distance ranging from ten to forty-eight units. When it is realized that the two exceptions were subjects who evidenced variability in the trials preceding the blocking, it becomes apparent that no subject shortened the route who had not shown some exploratory behavior in the maze. However, two subjects who had been variable in the preceding trials failed to shorten. It is of interest to note that these two subjects (F722 and F801) were judged by the experimenter and assistant as least motivated.

It follows from the preceding discussion that exploratory behavior, either on the first blocked trial or previous to it, was prerequisite to shortening the route. So far as the data indicate, exploratory behavior is the only decisive factor. It must be pointed out, however, that its presence was not sufficient to dictate that distance would be shortened.

Of further interest is the fact that blocking caused some variability in the behavior of four of the subjects without effecting selection of path 1. One of the subjects (F722) actually shortened the distance, varying between paths A2B1, A2C, and A2B3C. It will be seen that she is one of the subjects noted above as having been variable in preceding trials. The other three subjects, although taking shorter routes at times, finished the experimental period of ten trials after blocking by selecting path A4C. Two of the subjects were even used for five additional trials with no resulting change in path-selection.

SUMMARY

The findings for the broken field maze experiment are summarized below.

1. Sixteen, or 64 per cent, of the subjects evidenced constant path-selection behavior (recurrent selection of same path); nine, or 36 per cent, were variable in their selection of paths. Eight of the variable subjects manifested a tendency toward constant path-selection behavior. Of the thirteen constant subjects retested after a period of one week, twelve, or 92 per cent, evidenced the same path-selection behavior. It follows that constant reaction to identical path or pattern must be regarded as the typical reaction of these subjects in a maze pattern of the type used.

2. Eleven, or 69 per cent, of the constant subjects set up path-selection habits in one trial, four in two trials, and one in four trials. Thus fifteen, or 94 per cent, rapidly established path-selection habits.

3. As far as the data indicate, visual cues are most operative in this sort of habit formation.

4. Forward-going tendency may be a determining factor in path-selection, but it is not the only operative factor. Previous experience is shown to be important.

5. Analysis of the factors related to variability reveals: (1) No subject below a chronological age of two years, five months or a mental age of three years, five months was variable. Difference in mean mental age of the variable and constant groups is statistically significant and difference in mean chronological age approaches significance, the variable group being older in both instances. (2) Of the subjects who had previously been used in preliminary work, five, or 71 per cent, evidenced variable path-selection behavior. Of the inexperienced subjects, four, or 22 per cent, were variable. (3) Original path-selection behavior may determine variability. Center paths, which offer more choice junctions than side paths, were selected by all variable subjects on the first trial. Only five constant subjects first used center paths. (4) Variability of four subjects may possibly be explained in terms of excess time resulting from inadequate motivation, and employed in circumspection and exploration. (5) The variability of five subjects may possibly be explained in terms of impetus with exploratory behavior, or in terms of direction orientation and comprehension of the situation with or without impetus.

6. As far as these data indicate, time values in maze behavior bear little if any relation to mental or chronological age.

7. Abrupt drops in time curves indicate rapid adjustment to this maze situation.

8. Of the fifteen subjects used on the blocked trials, eight failed to shorten distance to the new exit in ten trials or more and seven succeeded in taking the new route in from one to five trials.

9. Only one factor is found to be related to shortening the route. No subject succeeded who had not manifested exploratory behavior on the first blocked trial, or variability previous to it. Only two subjects who had previously exhibited variable path-selection behavior failed to shorten the route. Inadequate motivation is suggested as the reason in both cases.

EXPERIMENT WITH QUADRUPLE CHOICE MAZE

In order to discover whether greater constancy of behavior would be obtained by a maze situation which presented fewer possible paths, so disguised that complete visual exploration was not possible, an experiment using the maze pattern designated as QC was conducted.

The three sections nearest the entrance in the BF maze were removed, thus making a choice compartment 8 feet square. In order to disguise the four resulting pathways leading to the exit, curtains were hung 3 inches from the front and from the rear of each path (Figure 4 on page 210). The curtains, 28 inches by 48 inches in size, were of blue cheviot material, weighted at the bottom corners with one ounce lead weights, and supported by hems to a pole resting across the tops of the maze units. The pole was held stationary by large paper clamps on either side, and supported the curtains so that they just touched the floor.

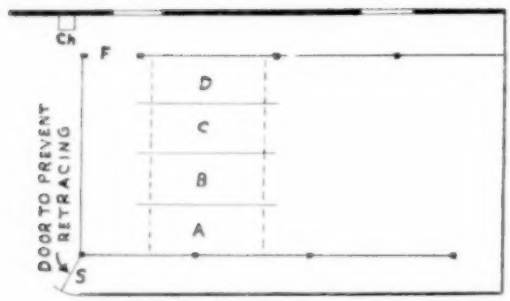

Figure 4. Quadruple Choice Maze. Broken lines indicate position of curtains.

Fourteen subjects were used having a mental age range of two years, four months to four years, seven months and a chronological age range of two years, one month to three years, zero months. Eight of the subjects had had experience in the preliminary work and seven were from the inexperienced group of the previous experiment. No change in procedure was made with the experienced subjects. After testing subject F771 with the procedure used for new subjects in experiment BF, it was decided that for them the curtain situation demanded special training. The five remaining subjects were guided, therefore, through one of the paths by the experimenter. No words were spoken during the guidance trial. Immediately afterward, the child was told to go alone to find the dog, the subsequent procedure being the same as in experiment BF.

Retests were given approximately one week later to thirteen of the subjects. When it was decided about a month later to block the paths in this pattern, only seven of the subjects were available. On the blocked tests the subject was allowed four or five trials[1] in order to reëstablish the old path-habit or build a new one, then that path was blocked by inserting a unit 2 feet in width at the rear of the path. The unit was fastened at the floor as were the others, and at the top by paper clamps to a cross wire attached to the ends of the maze units. The unit was immediately behind the second curtain and was not visible to the subject until he had lifted both curtains.

Another 2 foot unit was swung on hinges at the entrance to the "starting box", making exit by retracing impossible. If the subject retraced, he was told to go back and find the dog. If after three minutes any subject had not succeeded in finding another pathway, he was called by name and again told to find the dog. Additional calls followed at intervals of one minute. If crying resulted, the experimenter directed the subject to one of the other curtains by pointing and verbal instructions, rather than risk the possibility of having to discontinue the experiment. This also was the reason for calling the subject after a three-minute period of inactivity or unsuccessful efforts.

After the subject had set up a new path habit, that path was blocked; later the third path was also blocked if a third criterion was satisfied.

During the latter part of this prolonged experimental period some of the subjects showed signs of fatigue. Disinterest was also apparent at times. Conversation between trials was indulged in as a means of maintaining interest.

In this connection, the belief is held that it is a fundamental fallacy to assume constant and comparable motivation in different subjects merely because the stimulus-object is kept constant. Motivation in an experiment using young human subjects is the result not only of the stimulus- or so-called goal-object but of many other factors: previous experience of child, attitude of experimenter, instructions, occupation of child when called for experiment, manner of conduction to experimental room, physiological condition of the subject, and many other factors which defy deliniation. In spite of attempts to define stimulating objects or conditions and to hold them constant, it is believed that the most valid results, at least in an experiment of this sort, will be obtained if every possible means is exploited to obtain optimal motivation. From this point of view, conversation as a means of counteracting fatigue and growing disinterest (that is, as a means of counteracting

1. Warden's (15) suggested criterion of four out of five trials was here followed.

stimuli which were gradually losing their motivating strength) is believed justified.

RESULTS AND DISCUSSION OF EXPERIMENT WITH PATTERN QC

Path-Selection Behavior

The path-selection behavior of the fourteen subjects used in this experiment is noted in the following tabulation:

	Subjects Showing Constant Behavior	Subjects Showing Variable Behavior	Total
Test	11	3	14
Retest	8	5	13

Although only three subjects are seen to be variable in the first test, the retest indicates that five must be considered variable. Thus nine, or 64 per cent, manifested constant behavior throughout the two tests and 36 per cent were variable. The values are seen to be identical with those found in experiment BF. The new maze, therefore, determined greater constancy of behavior on the first test only.

Three of the variable subjects were from the former experienced group, all having shown variability in the previous experiment. The two subjects who showed variability on retest only were from the guidance group. Neither had been variable in experiment BF.

Of the five constant experienced subjects, one selected path A, two path B, and two path D, each continuing to use the path selected on the first trial. The six subjects who were guided by the experimenter continued in the path of guidance throughout the first test: two in path A, two in path B, and two in path D. It is seen that eleven, or 100 per cent, of the fourteen constant subjects set up a path-selection habit in one trial which persisted throughout the first test. When this value is compared with 69 per cent in the previous experiment, it is apparent that more subjects set up a habit in one trial in the quadruple choice situation than in the broken field situation. Whether this is the effect of additional experience, of the situation itself, or of guidance will be investigated in the following experiment.

Of the ten constant subjects who were retested, eight, or 80 per cent, reëxhibited the same path-selection behavior shown on the first test; two of them reacted in a variable manner. In experiment BF the value was 92 per cent. It is evident that path-selection behavior persists in the majority of constant cases over a period of one week.

When the paths of the five variable subjects shown in the following tabulation are studied, it is seen that variability of three of them is confined to two paths and thus approaches constancy. The tendency is is also noted to select one path oftener

	Experienced Subjects			Guided Subjects	
	F802	F801	M805	M798	F840
Trials	Test Retest	Test Retest	Test Retest	Test Retest	Test Retest
1	C B	C B	C B	B C	A A
2	B B	C D	C B	B B	A A
3	B B	C D	C C	B C	A A
4	B C	C A	C C	B A	A B
5	B B	D A	B C	B B	A B
6	B C	D A	C C	B	B
7	B C	D B	C C	A	B
8	B B	D C	C C	B	B
9	C B	D D	C C	A	B
10	B B	D C	C C	A	B

than the others. It will be further noted that two of the subjects vary between the two center paths, and may possibly be manifesting an habitual orientation toward the center of the maze without precise discrimination between the two center paths. A consideration of the tabulation indicates that even in the variable subjects a tendency is shown toward constant behavior. This is in agreement with the findings of the previous experiment.

Comparison of Variable and Constant Subjects

Since the variable group is so small and comprises three subjects whose variability is manifested only on the retest, comparisons between the two groups are of little value in themselves. It will be of interest, however, to compare any differences which are shown to exist with those reported in the previous experiment.

Several observations may be made from the tabulation given below: (1) The difference in mean mental age indicates that the variable group was slightly older. (2) The difference in mean chronological age is insignificant. (3) The constant group showed a slightly greater mean speed on its fastest run. (4) The constant group evidenced a considerably smaller mean per cent of trials after learning which contained excess time, indicating that these subjects were probably better motivated. These values acquire additional importance when it is realized that each shows the same trend found in the previous experiment.

	Subjects Showing Constant Behavior		Subjects Showing Variable Behavior	
	Mean	Range	Mean	Range
Mental age	3.23	2.33 to 3.83	3.53	2.75 to 4.58
Chronological age	2.52	2.17 to 2.83	2.55	2.17 to 2.75
Least time	5.60	4.00 to 6.50	6.30	5.00 to 7.00
Per cent of trials containing excess time	19.30	0.00 to 75.00	47.70	27.20 to 66.60

Absolute time values for both variable and constant groups are shown in Table IV and plotted in Figure 5 on the following page. In order to depict more accurately the time values of the two groups, test and retest scores have been plotted separately. Thus the table shows ten constant and three variable subjects for the first test, and seven constant and five variable subjects for the retest.[1]

Time curves for the constant subjects are seen to be lower and to fluctuate less than those of the variable subjects, a probable indication that the former were better and more constantly motivated. On the first test the drop is more rapid for the variable than for the constant subjects. Though the comparison includes but three children in one of the groups, the findings are seen to agree with those shown in Figure 3 of the previous experiment. It would seem that the subjects who evidenced variable behavior adjusted more rapidly to the situation. The findings do not agree with the previous ones on the height at which the curves of the two groups start, either for test or retest. However, as most of the constant subjects of the previous experiment had had no maze experience and as all subjects in the present experiment had had maze experience, perhaps the change in beginning height is to be expected.

Relation of Time Values to Mental and Chronological Age

In this experiment certain time values have been correlated with mental and chronological age. The results are given in the following tabulation:

	Mental Age			Chronological Age	
	n	r	P	r	P
Least time record	14	.60	Between .05 and .02	.50	Between .1 and .05
Excess time on first test (old subjects)	8	.03	Greater than .1	.01	Greater than .1
Excess time on first trial retest	13	-.06	Greater than .1	.10	Greater than .1
Mean excess time after learning	14	.55	Between .05 and .02	.57	Between .05 and .02
Per cent of trials after learning containing excess time	14	.46	Between .1 and .05	.42	Greater than .1

This tabulation should be considered cautiously. Although least time, average excess time, and per cent of trials after learning containing excess time correlate to some extent with both mental and chronological age,

1. As the time records of subject F771 (the inexperienced subject who was not guided immediately) are excessive, they have been here omitted. Time of first trial for subject M805 is also omitted since it was an exceptional performance. The subject had had less training in curtain mazes than had most of the other experienced subjects, which may account for his delay in the choice compartment. He was called after five minutes.

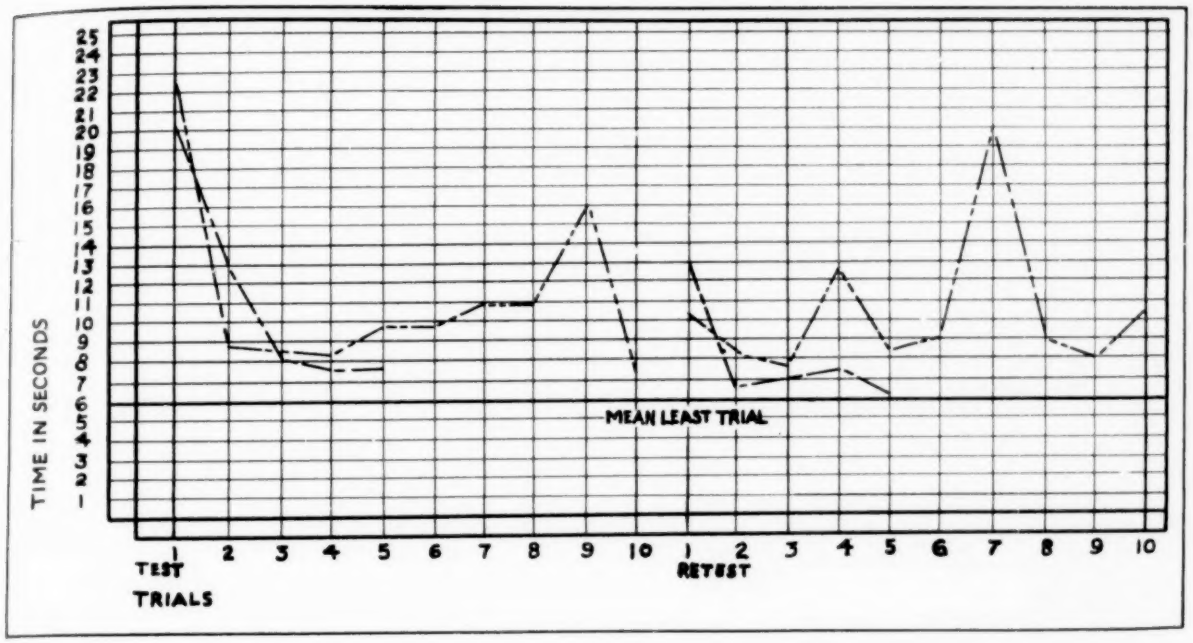

Figure 5. Time curves, experiment QC, test and retest.
——— — ——— Constant subjects.
——— — — ——— Variable subjects.

TABLE IV

TIME RECORDS FOR THE QUADRUPLE CHOICE MAZE

Trial	Constant Behavior		Variable Behavior	
	Mean	Range	Mean	Range
First Test				
	10 Subjects		3 Subjects	
1	21.1	8.0 to 95.0	22.5	9.5 to 35.5
2	12.5	5.0 to 40.5	8.8	7.5 to 10.0
3	8.4	5.0 to 11.5	8.7	7.5 to 9.5
4	7.8	6.0 to 13.5	8.5	6.5 to 10.0
5	7.8	5.0 to 12.0	9.8	8.0 to 13.0
6			9.8	7.0 to 11.5
7			10.7	9.5 to 12.0
8			10.8	8.0 to 13.5
9			15.3	7.0 to 25.5
10			7.3	7.0 to 7.5
Retest				
	7 Subjects		5 Subjects	
11	13.0	5.5 to 31.0	10.2	7.0 to 21.0
12	6.8	5.0 to 9.0	8.8	6.0 to 14.0
13	7.1	5.0 to 11.0	7.7	5.0 to 9.5
14	7.6	4.0 to 12.0	13.0	8.0 to 19.0
15	6.1	5.0 to 8.0	8.8	5.0 to 15.5
16			9.1	6.0 to 17.0
17			19.8	8.0 to 49.0
18			9.4	6.0 to 14.5
19			7.5	5.5 to 9.0
20			10.3	6.5 to 20.0

it is not possible to rely unquestionably on these results for the reasons pointed out in the previous discussion. Further indication of the unreliability of these findings is obtained when it is recalled that these same values in experiment BF show no relation (Table III).

Behavior of Blocked Trials

The seven children who were available one month later were used in the blocked trials. They represented a mental age range of two years, seven months to four years, zero months and a chronological age range of two years, two months to three years, zero months. During the first trials five of these children selected the path they had habitually taken on previous tests; one of the five showed some variability. The other two selected new paths, the new orientation habit being formed in each case in one trial. The one variable subject failed to satisfy a habit criterion until three of the paths had been blocked. (See subject F797 in Table V.) Reëxhibition of previous

TABLE V

BEHAVIOR ON BLOCKED TRIALS EXPERIMENT QC

Child	Chronological Age, Months	Mental Age, Months	Errors			Additional Errors			Total Errors All Trials	Trials Containing Errors		
			On First Blocked Trial	On Second Blocked Trial	On Third Blocked Trial	To First Criterion	To Second Criterion	To Third Criterion		To First Criterion	To Second Criterion	To Third Criterion
F797	31	46	1h	1h	3h	‡	‡	8h,4o	13h,4o	‡	‡	8
M799	32	43	1o	1h	2h	8o	3h	None	9o,6h	9	3	0
M839	30	41	1h	1h	1h,2o,1f	None	None	4o,1h,1f,2a	4h,6o,2f,2a	0	0	1
M798	31	39	1h	1f,1h	2h	None	15h,3f	12h,8o	31h,8o,4f	0	15	15†
M806	31	31	1h	1h	1h	1h	4h	None	8h	1	3	0
M841	26	36	2a,1f	1h	1h	None	None	1h	2a,1f,3h	0	0	1
F771	36	48	1h	2h	3h	None	2h	2o	8h	0	2	2

a = Retrace to entrance.
f = Reëntry into blocked path.
h = Entry into blocked path, then selection of adjoining path.
o = Entrance into blocked path, then selection of nonadjacent path.
† = Criterion not satisfied, experiment stopped.
‡ = Variable subject, did not satisfy criterion.

path-selection behavior was thus reduced to 70 per cent after a period of one month; after a period of one week it was 80 per cent.

Table V shows the number of trials taken by each subject to satisfy each criterion, the type of errors made on the first trial of each block, and the total errors on all blocked trials. When the types of errors made are analyzed, it is evident that the most frequent consists of entrance into the path previously taken followed by entrance into an adjacent path. The next most frequent error is entrance into the previously taken path followed by entrance into another path other than an adjacent one. It may constitute behavior similar to that of the first error mentioned, or it may be the omission of a path previously discovered to be blocked on trials subsequent to the second block. Reëntry into the blocked path is seen to occur but seldom, and in only one case (the chronologically youngest subject) on the first blocked trial. Retracing to the "starting box" occurred in only the two chronologically youngest children, twice by the youngest subject on the first blocked trial and twice by the next youngest during the first trial after the third block. In these subjects the usual type of behavior upon blocking was exit from the blocked path and immediate trial of one of the other paths, after pushing upon the blocking unit and poking at the cloth for varying periods of time. Only the youngest subject (M841) had to be called upon, whereupon he retraced to the maze entrance instead of trying a new path. After his second retrace he was guided through path A, his previous path having been D. His adjustment to the new path was immediate and certain, the criterion being satisfied in four trials.

It is interesting to note that after true errors have disappeared evidence of the old path-habit is still seen in misorientations which usually continue in varying degrees while the criterion is being satisfied. They range from misorientations of only the head and eyes upon entry into the choice compartment to complete misdirection of run to the former path, followed by an abrupt reorientation sometime during the course of the run. (If the curtain to the former path was lifted, an error was counted.) This type of behavior is construed to be further evidence that path-selection habits are set up largely in visual terms as was suggested by experiment BF.

It has been pointed out above that one of the subjects altered his path-selection behavior in one trial. It will be seen from the table that this same immediate reorientation and learning of a new path habit is evidenced in three more of the six subjects who satisfied the criterion, while one other subject required only one additional error trial. Thus, in five out of six cases, or 83 per cent, a new path-selection habit is rapidly set up. The other subject required nine error trials.

In satisfying the criterion after the second block, two of the six subjects again showed immediate adjustment, three required three or less error trials, and one used fifteen. Again 83 per cent showed comparatively rapid readjustment. Of the seven subjects who satisfied the criterion after the third block, two who had not as yet shown immediate reorientation were the only ones to adjust in zero error trials. Two others required but one error trial, and one used two error trials. Thus five subjects, or 70 per cent, showed rapid learning of a fourth path-selection habit. The variable subject who had satisfied neither of the previous criteria required eight error trials when all but one path was blocked. The subject who had needed fifteen error trials to satisfy the second criterion now failed to set up a new path habit in the same number of trials. As his behavior appeared to be quite stereotyped and as he was obviously fatigued, the experiment was discontinued. In general, it may be said that children set up new path habits in this maze situation rapidly and with few errors when they discovered that the path previously taken did not lead to the exit.

Of some importance is the fact, first demonstrated in these experiments but often observed in the preliminary work, that young children eliminate unnecessary activity in mazes if well motivated, as measured in terms of constancy of time records. This evidence seems to support the so-called "law of least action." However, whether the behavior described is actually the result of a tendency toward least effort is seriously questioned. Rather, it is suggested that it may be the effect of a tendency toward least time which results in least action. Certainly, research is needed to clarify the concept.

Whether the results of this portion of the experiment bear any relation to mental or chronological age can hardly be inferred from these data. Correlation coefficients computed from seven cases would be of little value in themselves. However, for purposes of comparison with the next experiment to be reported, mental and chronological ages have been correlated with certain time, error, trial, and excess distance findings. The results are shown in Table VI on page 216. If they agree in trend with those shown in the triple choice experiment, perhaps they may be considered valid.

Of further interest are the absolute time records of these subjects. They are shown in the following tabulation and plotted in Figure 6 on the following page for the first four introductory trials, the blocked trials, and the first four trials after each block.[1] These time records indicate, that, with the exception of the cases

Trials	Mean	Range
1	16.1	6.5 to 33.5
2	12.6	6.0 to 33.5
3	9.1	6.0 to 12.5
4	8.7	7.0 to 12
First Block	21.7	15.0 to 35
1	9.2	6.0 to 12.5
2	11.4	6.5 to 12
3	8.7	6.0 to 14.5
4	8.7	6.0 to 14
Second Block	22.9	13.0 to 39
1	13.9	7.5 to 19
2	8.7	5.5 to 17
3	10.7	6.0 to 16.5
4	7.5	5.5 to 12.5
Third Block	26.4	12.0 to 44
1	13.6	6.0 to 22
2	10.0	5.5 to 17
3	9.9	5.5 to 17
4	9.1	5.0 to 28

1. Time of first blocked trial for subject M841 and first trial after third block for subject M839 have been omitted since they involved retracing. The influence of age was suggested.

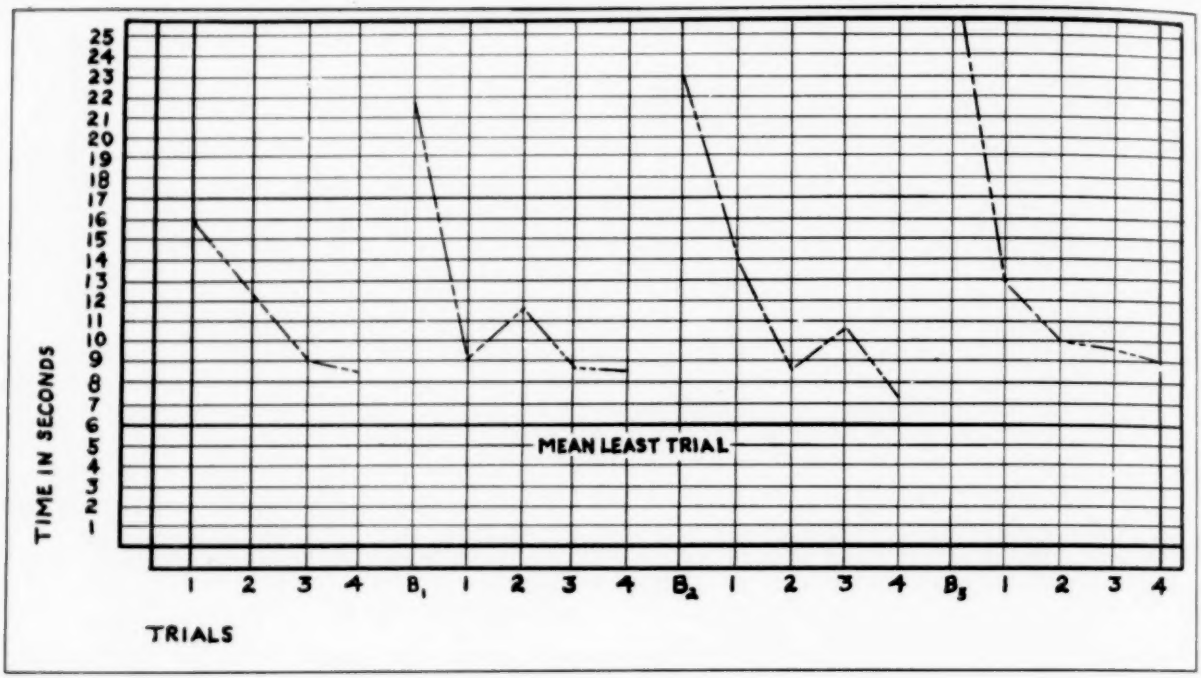

Figure 6. Time curves, experiment QC, blocked trials.

TABLE VI

COEFFICIENTS OF CORRELATIONS FOR BLOCK TRIALS

	n	Mental Age		Chronological Age	
		r	P	r	P
Excess Time					
First trial Test III	7	-.39	Greater than .1	.23	Greater than .1
First trial blocked	7	.04	Greater than .1	.16	Greater than .1
First trial after first block	7	-.16	Greater than .1	-.52	Greater than .1
Second trial blocked	7	.00	Greater than .1	-.43	Greater than .1
First trial after second block	7	-.53	Greater than .1	-.40	Greater than .1
Third trial blocked	7	.70	Between .1 and .05	.34	Greater than .1
First trial after third block	7	.19	Greater than .1	-.42	Greater than .1
Number of Trials					
To satisfy first criterion	6	.16	Greater than .1	.16	Greater than .1
To satisfy second criterion	6	-.18	Greater than .1	.10	Greater than .1
To satisfy third criterion	7	.13	Greater than .1	.03	Greater than .1
Excess Distance					
First blocked trial	7	-.34	Greater than .1	-.75	.05
First trial after first block	7	.45	Greater than .1	.16	Greater than .1
Second trial blocked	7	.41	Greater than .1	.65	Greater than .1
First trial after second block	7	-.07	Greater than .1	.64	Greater than .1
Third trial blocked	7	.65	Greater than .1	.34	Greater than .1
First trial after third block	7	.09	Greater than .1	-.19	Greater than .1
Total number of errors	7	.31	Greater than .1	.31	Greater than .1

noted below, readjustment to each blocked situation is rapid. Their chief value is for comparison with the same records in the triple choice experiment, affording a means of comparing experienced nursery school children with inexperienced orphanage children.

SUMMARY

An investigation of fourteen children in a quadruple choice maze resulted in the following findings:

1. Of the fourteen subjects nine, or 64 per cent, manifested constant path-selection behavior and five, or 36 per cent, were variable. The values are identical with those found in experiment BF. Only three subjects were variable on the first test. Two of the variable subjects of the previous experiment here evidenced constant path-selection behavior. The quadruple choice maze may be said to have determined greater frequency of constant behavior on the first test, but not on the retest.

2. All of the constant subjects of the first test set up path habits in one trial. Thus a value of 100 per cent, compared with 69 per cent in the previous experiment, indicates greater frequency of habit formation occurring in one trial in this maze situation. Guidance or experience may be partially responsible for this result. All guided subjects were constant during the first test. All subjects for this experiment had been used in the previous experiment.

3. Eight of the retested constant subjects, or 80 per cent, reëxhibit the same path-selection shown on the first test. In experiment BF the value was 92 per cent. Path-selection habits are thus retained by the majority of the constant subjects over a period of one week.

4. Tendency of the variable subjects toward constant path-selection behavior is again indicated.

5. Comparisons between variable and constant subjects indicate the same trends disclosed in the previous experiment. The variable group is so small, however, that the differential findings are of value only for purposes of comparison with the previous experiment.

6. Time values for all subjects were correlated with mental and chronological age. Although significant correlations were obtained in some instances, the findings do not agree with those of experiment BF and must therefore be interpreted with caution.

7. On the blocked trials the usual type of behavior was immediate selection of one of the other paths. Only the youngest subjects reëntered the blocked path or retraced to the exit. Orientations to the old path were still observable after true errors had been eliminated.

8. Formation of new path-selection habits after the first block occurred in four subjects in zero additional error trials, one subject required one error trial, and another nine. Thus five, or 83 per cent, rapidly set up a new path habit. After the second block two subjects used zero error trials, one required two error trials, two others took three, and one subject needed fifteen. Again 83 per cent show comparatively rapid readjustment. To satisfy the criterion after the third block two subjects required zero error trials, two needed but one each, another used two, one took eight, and the subject who had required fifteen to reach the last criterion now failed in fifteen trials to eliminate entrance into the previously taken path. Here 70 per cent showed rapid formation of a third new path-selection habit. In general, it follows that these children rapidly and with few errors continued to establish new path-selection habits when the path previously taken was discovered not to lead to the exit.

9. Time, trial, distance, and error values have been correlated with mental and chronological age values for purposes of comparison with the following experiment. In themselves the obtained correlation coefficients are of little value.

10. Time records have been plotted also for purposes of comparison. The time curves indicate that adjustment after each blocked trial is rapid with the exception of the two youngest subjects.

EXPERIMENT WITH TRIPLE CHOICE MAZE

In order to check and amplify the data obtained in the previous experiments, the

same maze units and curtains used at Iowa City were transported to the Iowa Soldiers' Orphans' Home at Davenport, Iowa and set up as shown in Figure 7. This enabled the experimenter to obtain a number of young subjects who had had no previous maze experience. A triple choice situation was used in order to rule out the possibility of selecting both of two middle paths, since the behavior of two subjects in the previous experiment had suggested that two middle paths were not discriminated as precisely as were right or left paths.

An experimental room in which lighting could be constant and evenly distributed was not available, so a large room in the kindergarten quarters was chosen. Quite uniform lighting was obtained by nine large windows and six large ceiling lights. Lighting was maintained relatively constant since the experiment was conducted on bright sunlit days between the hours of 8 to 12 A.M. and 3 to 5 P.M.

Small holes were bored in the floor to hold the pinion nails of the maze units. Nails were also used at the upper corners of each unit around which were fastened 16 gauge wires which guyed the maze securely to the floor. Heavy screw eyes were used for floor fastenings.

As will be seen from the diagram, the choice compartment was lengthened and entered by a starting path which directed the subject toward its center. In order to prevent retracing and to provide an observation screen, a 2 foot frame was covered with four thicknesses of large-mesh, black cheesecloth and swung on hinges from the right side of the entrance. As the wall back of this door was dark, the experimenter could observe the actions of the subject in the maze but only his shadow was visible to the subject. Since the subject rarely looked backward and then most infrequently after the first trial, the observation screen was adequate for the experiment. The curtains were supported across the units as in the previous experiment, a larger pole raising them about 1/2 inch from the floor.

As none of these subjects had previously been used in mazes and as it was desired to obviate all actual guidance in the maze itself, a preliminary pathway was set up consisting of two sections 2 feet apart, placed at one side of the maze but in line with it. Two curtains were hung in the pathway thus made, the first being 15 inches from the front and the second being 3 inches from the rear. An entrance to a pathway was thus simulated. The curtains were hung by paper clamps to cross wires and could be slid easily from side to side. The purpose of this preliminary path was to train the subjects to lift or push aside curtains in order to pass them.

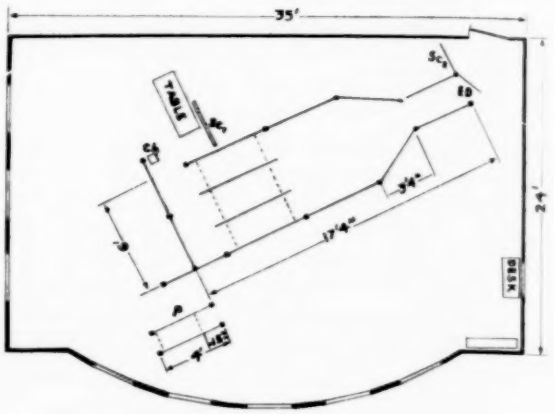

Figure 7. Experimental room showing triple choice maze in position.

P	Preliminary set-up
ED	Entrance door with observation screen
SC1	Screens to prevent inspection and selection of
SC2	direct path to exit
T	Table
Ch	Chair on which stimulus-object was placed
Dotted lines	Show curtains
▪	Show junction of units
X	Windows

As may be seen in Figure 7, a long table and screen were placed by the exit in order to eliminate the possibility of the subject returning immediately to the otherwise visible entrance. Another section was placed at the right of the entrance in order to disguise and make impossible the outside path to the stimulus-object which was placed on a small chair at the exit.

The stimulus objects consisted of a 10 inch Weaver Health Ball, a tambourine, a set of three bells on a strap, Hershey Milk Chocolate bars the squares of which were cut into sixteenths, and the toys and dogs previously mentioned. The previous experiments had indicated that behavior did not necessarily remain constant with the same type of stimulus-object. So it was decided, as previously mentioned, that more comparable results would be obtained if effort was made to attain greatest possible interest. Thus if a child showed signs of disinterest, the stimulus-objects were changed according to the changing enthusiasm manifested. The assistant and experimenter both conversed with the child between trials if he seemed to enjoy it.

The subjects were forty children residing at the orphanage. They ranged in chronological age from one year, zero months to four years, nine months and in mental age from zero years, eleven months to five years, five months. The mental age of thirty-six subjects was determined by use of the Kuhlmann-Binet scale and the remaining four were tested on the Stanford-Binet scale.

The procedure was in all cases essentially the same. One of the older girls from the orphanage obtained the subject from his residence, brought him to the experimental building, and played with him in an adjoining room until he was needed. Then she brought him to the experimental room and returned the subject previously used. The assistant immediately engaged in play and conversation with the new subject until all evidence of fear had subsided, at which time the experimenter joined in the play. As soon as the child seemed adjusted, the preliminary training was begun.

The experimenter stationed himself at the exit of the preliminary pathway, with the assistant and the subject at the entrance. The two curtains were pushed aside leaving the pathway partially open. The ball was thrown to the experimenter and the child told to "get the ball." The second trial was a duplicate of the first. On the third and fourth trials the second curtain was closed, and on the fifth and sixth trials both curtains were closed. In some of the younger cases it was necessary to give more than six trials.

It was early discovered that if the curtains were opened on the right side and the child returned to the entrance on the right, a right orientation was built up which manifested itself later in the maze. Accordingly, three types of preliminary training were given: (1) curtains opened on the right and subject returned to the right, (2) curtains opened on the left and subject returned to the left, and (3) curtains opened alternately left and right and subject returned alternately left and right or vice versa.

If chocolate or a toy was to be used as the reward, it was presented after the last preliminary trial. The child was then allowed to see the assistant place another piece of chocolate or a toy on the chair at the exit of the maze. If dogs or toys were the stimulus-objects, they were brought back to the entrance of the maze and the child was encouraged to place them on a table. He was then told to find another one.

During the course of the experiment one subject, who manifested no interest in candy or toys, wanted to continue playing ball. So the ball game was continued over the maze, the experimenter taking the child to the entrance, opening the door, stationing the child at the entrance, and throwing the ball to the assistant at the end of the maze. If necessary, the child was immediately told to get the ball which was placed on the chair by the assistant. It was then brought back to the experimenter by the subject and again thrown. On all except the first trial the door was closed when the ball was thrown. The assistant stood at the center of the rear maze wall, so that if the direction of flight of the ball influenced the path of the child, the influence would be constant. The ball was used in the majority of cases not only because of its interest value, but because it served to shorten the experimental period and make the interval between trials relatively constant.

In order to keep experience comparable and to serve as a check on the quadruple choice experiment, all subjects were given ten trials at the first test. One week later retests were run on all but five of the subjects who had previously been successfully used. The retest was immediately followed by the blocking procedure described

in experiment QC. The same criterion of four out of five trials was required.

RESULTS AND DISCUSSION OF EXPERIMENT TC

Minimum Age of Maze Subjects

Thirty-three of the forty subjects attempted were successfully used in this maze pattern. The data on one subject were discarded since his chronological age was in question. The following results are thus based upon findings with thirty-two subjects.

Of some interest are the seven cases whom it was impossible to use. Their chronological ages in months were twelve, fifteen, twenty-one, twenty-one, twenty-five, thirty-three, and forty-five. Mental ages were available for only four of these subjects; they were eleven, eleven, twenty-one, and twenty-two months. Failure to use these children in the maze is probably to be attributed to a combination of inability to rapidly adjust to a new situation, insufficient motivation, and retarded or immature mental development.[1]

The youngest subject used successfully was twenty-two months in both mental and chronological age. One younger mental age, twenty-one months, was used, the subject having a chronological age of twenty-three months. Although ten trials were obtained after much effort from the first of these two subjects, both were returned to the experimental room on the following day at which time trials without crying were obtained.

Difficulty was had with two older subjects on the retests. Hard crying resulted and the trials were discontinued. Only two trials were obtained from each. Although there was occasional crying from some of the other subjects (upon first being taken into the experimental room, upon the first trial in the maze, or upon the blocked trials), it was not so serious that the condition could not be alleviated and the experiment continued. This matter brings forcibly to light the danger in making comparisons between different sorts of populations. The children living in the orphanage are relatively unused to strange faces or new situations. Their behavior is thus markedly different from that of preschool children in a similar situation. A point worthy of note, however, is the rapidity with which emotional upsets were altered to smiling coöperation. Many times the subjects would cry on the first trial in the maze or on the blocked trials, only to come through smiling after being called, guided, or having discovered their own paths.

Path-Selection Behavior

The great predominance of constant path-selection behavior in this type of maze is indicated in the following tabulation:

	Subjects Showing Constant Behavior	Subjects Showing Variable Behavior	Total
Test	29	3	32
Retest	26	1	27

Of the thirty-two subjects, twenty-nine, or 91 per cent, were constant in their path-selection behavior, while three, or 9 per cent, were variable. Twenty-two of the constant subjects, or 76 per cent, set up the path habit in one trial, five others used two trials, one took three, and one four. As the per cent of children learning in one trial is here slightly less than that shown in the QC experiment, further evidence is afforded for the assumption that the high percentage in that maze was the effect of both previous maze experience and guidance. Nevertheless, using an unguided and inexperienced group in experiment TC, learning is quite rapid since twenty-seven children, or 93 per

1. These results must not be interpreted to mean that infants cannot be used in maze studies. They indicate only that it was found impossible to use these subjects under these conditions. Two creeping infants, eleven and fifteen months of age, had formerly been used in the BF maze, calling on the part of the father being the stimulus. Both children crept through for several trials, about fifteen being obtained from the youngest. Unfortunately, motivation did not remain adequate, with the result that both children began exploring the maze, creeping from point to point. (It is of interest that this exploratory behavior, also typical of the rat in a new maze situation, is quite different from the visual exploration of the upright-walking child of two years.) It is believed that with proper preliminary training, especially in regard to motivation, creeping infants can successfully be used in simple maze studies.

cent, established a path-selection habit in two trials or less.

When the paths taken by the constant subjects are considered, path C shows the highest frequency, being selected by sixteen subjects. Path A was taken by four, and path B by five. The paths of the three variable subjects are shown in Table VII. Time, age, and speed records have been included for comparison with the time records for all subjects (Table VIII and Figure 9). It will be seen that a tendency toward constancy is indicated in at least two of these subjects.

Path Taken First Trial	Frequency, Type, and Results of Preliminary Training				
	Left	Right	Alternate	Not Recorded	Total
A(Left)	10	0	0	2	12
B(Center)	1	1	1	1	4
C(Right)	6	4	5	1	16
Total	17	5	6	4	32

It will be seen that a tendency is present for right or left preliminary training to influence right or left orientation in the maze, and also that path-selection is not positively determined in all subjects by the type of preliminary training. As five of the six subjects who received alternate training first oriented to the right in the maze, and as six of the seventeen subjects receiving left training first oriented to the right in the maze, it seems possible that a right orientation may exist in some children. Whether it is related to dextrality, is predetermined by previous similar experience, or is the result of direction

TABLE VII

PATH AND TIME RECORDS (TIME IN SECONDS) FOR VARIABLE SUBJECTS

Trial	M30 (C.A., 3 years, 6 months; M.A., 3 years, 6 months)				M24 (C.A., 2 years, 11 months; M.A., 3 years, 7 months)				M40 (C.A., 3 years, 6 months; M.A., 4 years, 1 month)			
	Test		Retest		Test		Retest		Test		Retest	
	Path	Time, Seconds	Path	Time, Seconds	Path	Time, Seconds	Path	Time, Seconds	Path	Time, Seconds	Path	Time, Seconds
1	C	15	C	10	C	100c	B	10	A	11.5	C	7
2	B	10	C	12	C	12	B	8	A	9	C	8
3	B	10	B	13	C	10	B	9	A	9	C	7
4	B	15	C	12	C	10	B	10	A	8	C	7
5	B	20	C	11	B	10	B		A	9	C	
6	C	22	C		B	8.5			C	8.5		
7	C	8			B	8.5			C	8.5		
8	C	11			B	9			C	8.5		
9	C	15			C	9			C	7		
10	C	5			B	8.5			C	6		
Least Time		8				8.5				6		
Trials Containing Excess Time First Test	7				0				1			

orientation to the exit would seem to be a problem worthy of investigation.

Besides the three variable subjects, six others did not continue in the path selected on the first trial. Two of them had had alternate training, three left training, and for one the preliminary trials were not recorded. As four of these children altered their path-selection in the direction of path C, it might seem possible that they had discovered at once and chosen the shortest route to the exit. Since three of them were among the youngest subjects used, and since so many older children did not show this type of response, this explanation of their behavior must be questioned. It remains a real possibility, however, in the fourth subject who represented the highest mental and chronological age value in the experiment. His first path selection was A (time 8.5 seconds), his second was path B (time 6 seconds), and the remainder were through path C. No excess time was shown.

Retests were given to twenty-seven of the thirty-two subjects. As previously stated, only two trials were obtained from two of the subjects, both taking the same path each trial that they had taken the previous week. Of the other twenty-five subjects twenty-two had been constant. Eighteen of them, or 82 per cent, reëxhibited the same path habits shown on the first test. The other four subjects selected paths other than those taken on the first test. All were constant subjects and all now satisfied the criterion in four trials. Only one altered to path C; his previous path habit had been A. Since he was chronologically the oldest subject used, it is possible that the retest behavior indicates true orientation to the exit. For the other three, in the light of a predominance of retentive path-selection behavior on all three experiments, lack of retention seems most probable. It is of further interest that only one subject, M30, was variable on retest.

Comparison of Variable and Constant Path-Selection Behavior

A comparison of variable and constant subjects is hardly warranted in this experiment since only 9 per cent of the subjects were variable. However, to discover whether they differ from the other subjects they will be compared in certain respects with the means and ranges of all subjects. Table VIII on the following page shows these means and ranges, the subjects having been divided into three groups for consideration of chronological age differences. Subjects M30 and M24 are to be compared with the means of the middle age group (Group II) and subject M40 with the means of the oldest group (Group III). When these data are inspected with those of the variable subjects (Table VII), it is apparent that age, either mental or chronological, cannot be responsible for variability. However, it can be stated that no subject younger than three years, six months or mentally below two years, eleven months evidenced variability.

The least time records of subjects M30 and M24 are higher than the mean of their group, and constitute the top of that range. This is in agreement with the findings of the previous experiment. When the number of trials after learning which contain excess time are considered, M30 shows five while M24 shows none. The former was evidently poorly motivated and the latter at least consistently slow. The least time, however, of M40 is normal and his time records are seen to contain no excess time. (Half-seconds are not considered as excessive.) The interesting fact here is that his path-selection behavior differs from that of the other two variable subjects, who are seen to vary from path C to B. This subject instead varied from path A to C, and after taking C never again altered his path. His reaction on the altering trial may probably be attributed to direction orientation, comprehension, or merely curiosity, but not to impetus. In fact, on the altering trial and on the subsequent three trials his orientation was to path A, followed by abrupt reorientation toward C during the course of the run. His path straightened only on the tenth and last trial. Retest orientation was immediately to path C.

In concluding the discussion of constant and variable behavior, it is to be emphasized that the typical response is one of constancy. Of the six possible factors related to variability which were pointed out in the discussion of experiment BF, either mental or

TABLE VIII

ABSOLUTE TIME RECORDS (TIME IN SECONDS) DIVIDED INTO CHRONOLOGICAL AGE GROUPS

Trial	Group I (N = 10)		Group II (N = 11)		Group III (N = 11)	
	Mean	Range	Mean	Range	Mean	Range
Test						
1	67.5	5.0 to 175	87.3	9.0 to 180.0	12.6	8.5 to 24.0
2	29.0	7.0 to 103	17.3	7.0 to 43.0	9.8	6.0 to 22.0
3	15.0	7.0 to 35	9.5	7.0 to 12.0	8.1	6.0 to 10.0
4	10.8	6.5 to 12	9.5	7.0 to 11.0	8.1	5.0 to 10.0
5	10.9	7.0 to 14	9.8	7.0 to 11.0	8.0	6.0 to 10.0
6	12.4	7.0 to 21	9.9	7.0 to 11.0	7.6	5.0 to 10.0
7	11.0	6.0 to 17	9.0	7.0 to 12.0	7.6	5.5 to 11.0
8	12.5	7.0 to 22	8.6	6.5 to 12.0	7.3	5.0 to 9.0
9	10.6	6.0 to 15	9.4	6.0 to 13.0	7.3	5.0 to 9.5
10	11.3	7.0 to 20	7.7	5.0 to 10.0	7.2	5.0 to 10.0
Retest						
1	13.0	6.0 to 23	9.3	6.0 to 12.0	7.6	5.0 to 13.0
2	15.7	5.0 to 63	9.4	6.0 to 14.0	7.3	5.0 to 12.0
3	14.5	6.0 to 50	8.4	6.0 to 13.0	7.0	4.0 to 11.0
4	11.9	6.0 to 26	9.3	6.0 to 13.5	6.9	5.0 to 9.0
First Block	152.1	63.0 to 180	80.1	15.0 to 180.0	120.5	17.0 to 180.0
1	16.1	8.0 to 27	14.1	7.0 to 28.0	9.1	5.0 to 14.0
2	16.3	6.5 to 42	11.8	7.0 to 29.0	9.7	7.0 to 14.0
3	38.6	9.0 to 95	12.3	7.0 to 21.0	8.4	6.0 to 11.0
4	11.0	6.0 to 14	9.4	6.0 to 17.5	9.5	6.0 to 13.0
Second Block	132.4	25.0 to 180	67.4	16.0 to 180.0	22.9	14.0 to 51.0
1	122.1	12.0 to 180	18.2	9.0 to 31.0	11.9	6.0 to 18.0
2	131.0	15.0 to 180	13.9	7.0 to 22.0	12.0	6.0 to 19.0
3	79.7	9.0 to 180	10.5	6.0 to 17.0	11.7	5.0 to 17.0
4	100.0	23.0 to 180	11.8	7.0 to 14.0	12.6	5.0 to 16.0

chronological age has been shown to be incidental above a certain necessary minimum. Impetus has not been operative in the choice compartment experiments nor could a certain type of path-selection have effected variability although it might have operated to prevent it. Inadequate motivation (manifested in slow maze behavior with many trials containing excess time) or comprehension of the maze situation resulting from experience, circumspection, or exploration remain the conditions resulting in variable behavior. Conversely, age under a certain critical level, inexperience, or strong motivation seems to be the factors which predetermine constant behavior.

Relation of Time Values to Mental and Chronological Age

Due to crying or to three minutes of inactivity or exploratory behavior in the choice compartment, thirteen of the thirty-two subjects were called on the first trial in the maze. The assistant did the calling from a position outside the maze and immediately behind path B. Calling resulted in two types of behavior: returning to the entrance door in which case they were recalled, or pushing, usually at once, upon the curtains and effecting exit. Calling was resorted to on subsequent trials if necessary.

When the called group of thirteen subjects is compared with the uncalled group of

nineteen subjects, it is seen from the following tabulation that chronological age is a significant factor, but that mental age is not:

Age	Called Group		Uncalled Group		n	t	P
	Mean	S.D.	Mean	S.D.			
Chronological	2.32	.68	3.57	.80	32	2.286	Between .05 and .02
Mental	2.62	.67	3.07	.83	32	1.525	Greater than .1

Correlations of number of called trials on first test (Table IX) show also that age is a factor, the younger children requiring more calls.

tion.[2] With these subjects a more accurate measure of both speed and constancy of motivation could have been obtained if the retest had been extended to ten trials before blocking. As that would have prolonged an already lengthened experimental period, and as the rapidity with which the subjects could alter an old and form a new path-selection habit was the main problem under consideration, the question of running speed, adjustment, and motivation must at present remain unanswered.

Since the correlations for excess time first trial for uncalled cases in the first test and those for excess time first trial of the retest are not significant,[3] it

TABLE IX

CORRELATION COEFFICIENTS FOR TIME VALUES (TIME IN SECONDS) FOR EXPERIMENT TC

	n	Mental Age		Chronological Age	
		r	P	r	P
Number of called trials first test	13	-.67	Between .02 and .01	-.56	Between .05 and .02
Least time recorded	32	-.48	Less than .01	-.48	Less than .01
Excess time uncalled cases first trial first test	19	-.18	Greater than .1	-.38	.1
Trials after learning containing excess time	32	-.25	Greater than .1	-.43	Between .02 and .01
Excess time first trial retest	27	-.29	Greater than .1	-.28	Greater than .1

Since all subjects had ten trials on the first test in this experiment, only the first test trials were used in obtaining the basal speed or least time record. Correlations of least time recorded (Table IX) suggest that the older children tend to move more quickly in the maze, were better motivated, had adjusted more quickly to the situation, or any combination of the three.[1] In the light of previous findings with preschool children, it seems possible to interpret this result, as well as relationship between chronological age and number of trials after learning containing excess time, as the effect of greater ease of adjustment on the part of the older children which would in turn affect speed and constancy of motiva-

would seem that excess time on first trials bears no relation to mental or chronological age. It must be remembered, however, that these correlations were based only upon uncalled cases, and that a comparison with called cases on the first trial of the first test indicated that at least chronological age was a significant factor.

Since throughout these experiments chronological age has appeared to be more closely related to time values than has mental age and since comparison of only two groups might conceivably disguise existing differences, the subjects have been divided into three chronological age groups in order to discover what differences would appear. The time records for these three groups are

1. Partial correlation with mental age held constant gave a coefficient of -.25. With chronological age held constant the result was -.23. Neither are statistically significant.
2. When mental age is partialled out of correlation with number of trials after learning containing excess time, the coefficient is found to be -.37 and thus statistically significant, P being between .05 and .02. When chronological age is held constant, however, the coefficient drops to .06. The chronologically older children are then more constantly motivated.
3. Partial correlation here resulted in lowering the coefficients when either mental age or chronological age was held constant.

shown in Table VIII and plotted in Figure 9.

The mean chronological and mental ages of these three groups as well as mean least time values and number of trials after learning which contain excess time are shown in the following tabulation:

	Mean	Range
Group I		
Least time	8.50	5.00 to 11.50
Chronological age	2.26	1.83 to 2.67
Mental age	2.11	1.58 to 2.58
Trials containing excess time after learning	1.70	0.00 to 5.00
Group II		
Least time	7.50	6.00 to 8.50
Chronological age	3.51	3.08 to 3.83
Mental age	3.07	2.50 to 3.58
Trials containing excess time after learning	1.20	0.00 to 6.00
Group III		
Least time	6.20	4.00 to 9.00
Chronological age	4.22	3.83 to 4.75
Mental age	3.47	2.50 to 5.42
Trials containing excess time after learning	0.09	0.00 to 1.00

Mean differences are quite clearly indicated. The older children consistently take less time in the maze and show greater speed on their fastest run. The two older groups show flatter curves and thus appear to have been more constantly motivated. This

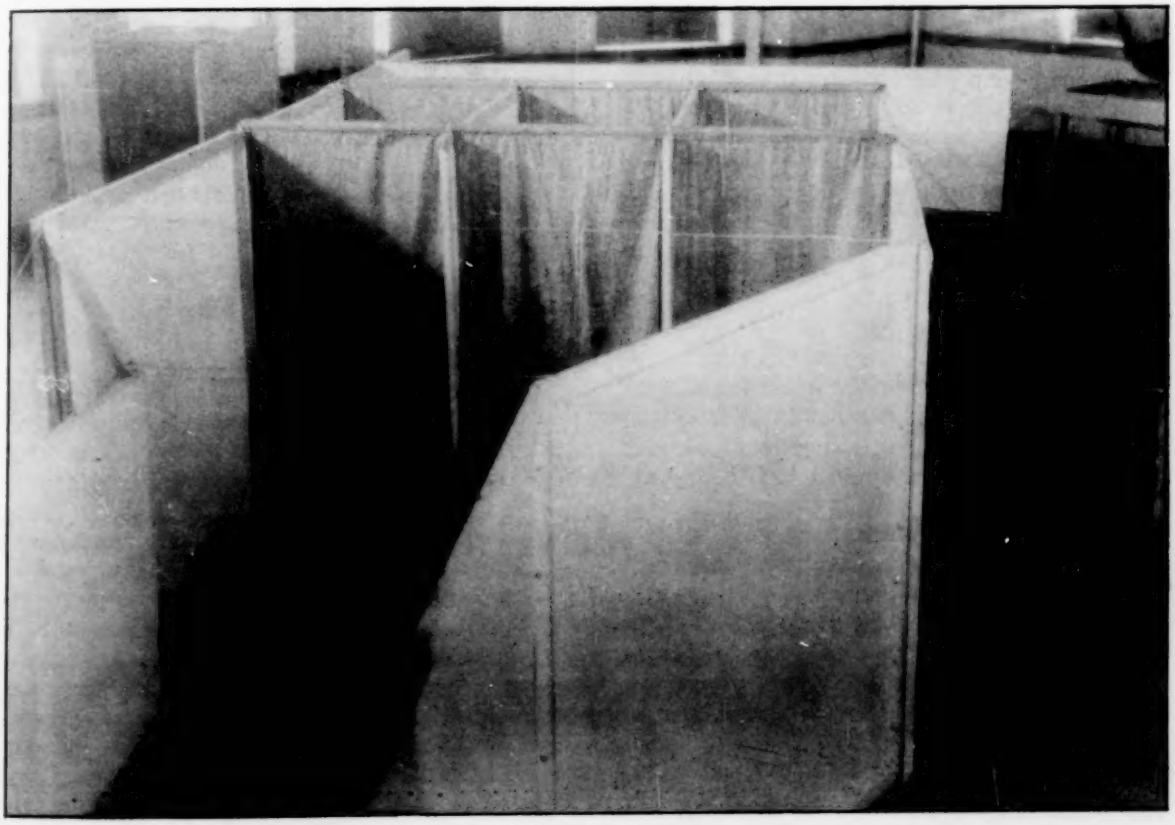

Figure 8. Triple Choice Maze. Preliminary pathway visible at upper left.

observation agrees with the differences shown between mean trials after learning which contained excess time.

The number of subjects showing zero trials with excess time steadily increases from four in the youngest group to seven in the next, and ten in the oldest. Twenty-one subjects thus evidence no excess time after learning and six more show two trials or less which contain excess time. It follows that 84 per cent of the subjects were well motivated if the concept of excess time here used is an adequate criterion by which to judge constancy of motivation.

In order to determine whether the time differences shown between the youngest (Group I) and the oldest (Group III) groups were statistically significant, mean times of sample trials were submitted to analysis by means of the Fisher formula. Two other values, least time recorded and number of trials after learning containing excess time, were also compared. The results are shown in Table X. It will be seen that all differences are significant with the exception of trial 2 which approaches significance. It may be assumed that the differences between the youngest and oldest groups shown in Figure 8 are significant in general.

mean mental ages of the three groups shown in the tabulation on page 225 indicates that the time curve of the lowest mental age group would not be greatly altered, but that the curves of the two older groups would not be clearly differentiated. The assumption that time values are more closely related to chronological age than to mental age seems again to be supported.

It may be concluded that in these young children, who have had identical preliminary training and whose maze behavior is similar, maze time in general bears an inverse relationship to chronological age. Whether the finding is actually the result of age or can be attributed to motivation, or whether motivation is itself so much influenced by age, are problems which the present data cannot attack.

In comparing the time curves of the constant subjects in experiment QC (Figure 5) with those of Figure 9 on the following page, it becomes apparent that the curve is quite similar to that of Group II in experiment TC. Though the QC subjects were all younger than those of the TC group, time on the first two trials of the latter group is seen to be greater. Only about one second of this increase can be attributed to the slightly longer maze. It would seem that the pre-

TABLE X

SIGNIFICANCE OF MEAN DIFFERENCES IN MEANS OF TIME RECORDS (TIME IN SECONDS) FOR YOUNGEST AND OLDEST GROUPS

	Youngest		Oldest				
	Mean	S.D.	Mean	S.D.	n	t	P
Trial 2 of test	29.0	34.26	9.80	4.04	21	1.7589	Between .1 and .05
Trial 7 of test	11.0	3.84	7.60	1.57	21	2.5732	Between .02 and .01
Trial 1 of retest	13.0	5.93	7.60	2.28	18	2.2933	Between .05 and .02
Least time	8.5	2.16	6.20	1.72	21	2.5844	Between .02 and .01
Number of trials after learning containing excess time	1.7	1.73	0.09	0.04	21	2.9419	Less than .01

As the correlation between mental and chronological age for the thirty-two subjects considered gives a coefficient of .68 (P is less than .01), a 68 per cent correspondence may be expected between the time curves plotted for the chronological age groups and those which might be plotted for three mental age groups. Inspection of the

school children adjust more quickly and more adequately to the situation in spite of their lower mean age. This difference does not show up on the first retest trial. Rather, the curve is seen actually to fall between those of the two low age groups of the TC subjects. Differences are manifested, therefore, on the first test only. Whether the

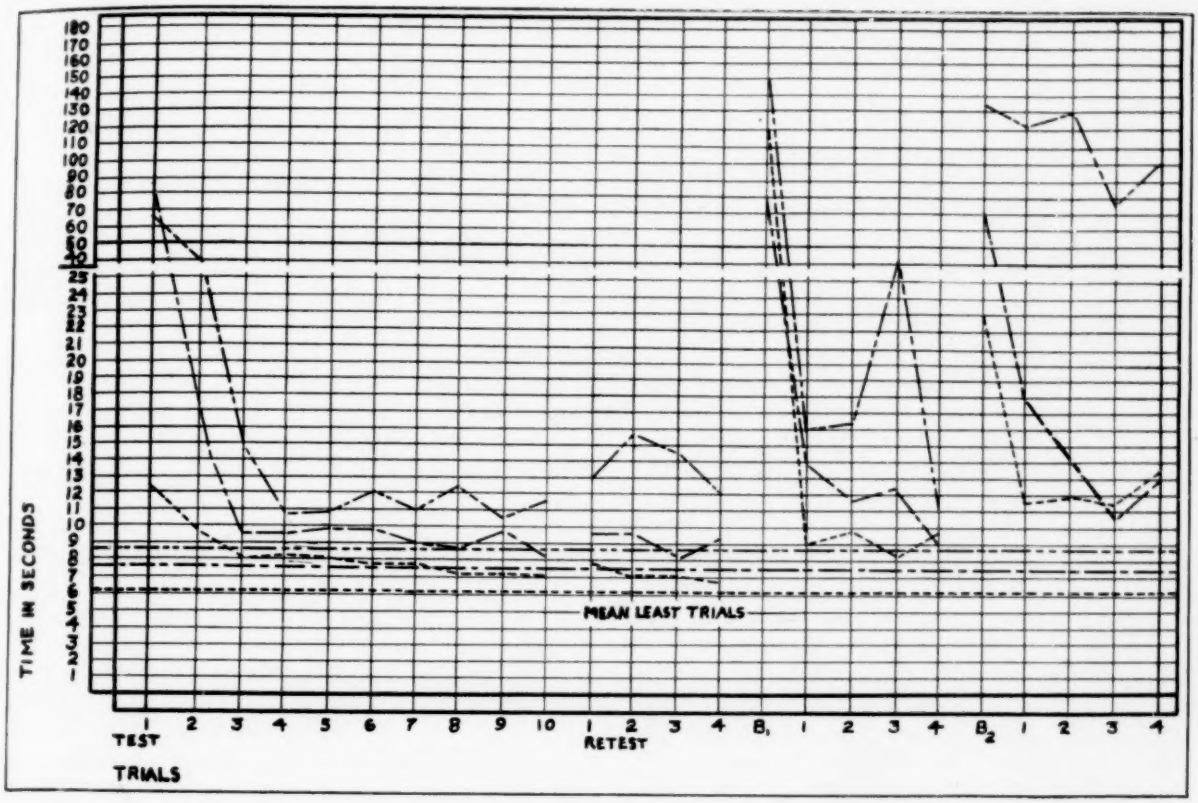

Figure 9. Time curves, experiment TC.
——— – – ——— Group I.
——— – – ——— Group II.
— — — — — — Group III.

factor responsible for these differences is preschool environment or previous maze experience cannot be answered from the data of these experiments.

Behavior on Blocked Trials

The behavior of the twenty-five children used on the blocked trials is summarized in Table XI on the following page. It will be seen that after the first block only two children failed to adjust to the new situation, while twenty-three satisfied the criterion of four out of five errorless trials after requiring zero to thirteen error trials.

For the youngest of these two cases, F23, the experiment was stopped due to continuous hard crying. For the other, F4, the second block was carried out before the first criterion was met due to unusual persistence of the former path habit. Not even then was the former habit interrupted for this subject. The original path had been B. Reaction to the first block was B-C. The second block was followed by three trials of B-C-A response followed by B-A. When the experiment was discontinued on the thirty-first trial, the second criterion had not yet been satisfied though path B had been eliminated on four different trials.

The failure of this subject can be attributed to a stereotyped path-selection behavior which in reality explains nothing. It is suggested, however, that this stereotyped behavior is similar to perseveration or the recurrence of a certain type of behavior not directed toward a goal object. Had this been realized at the time of the experiment, this subject and others like her would have been given additional trials, increased motivation,

TABLE XI

BEHAVIOR ON BLOCKED TRIALS FOR EXPERIMENT TC

Child	Chronological Age, Months	Mental Age, Months	Errors		Additional Errors		Total Errors All Trials	Trials Containing Errors	
			On First Blocked Trial	On Second Blocked Trial	To First Criterion	To Second Criterion		To First Criterion	To Second Criterion
					Group I				
F1	22	22	2a,2f,9c	12o,1a,9c	4a	6o,2a†	†	2	2 †
M34	23	19	1a,1f,1c	1a,1o	2h,1f	10f †	†	3	3 †
M17	24	24	1a,1c	1o,2f,1h	1h,3f,1o	26o,29f,4a,1h†	†	2	7 †
F23	25	21	1a,1f,1c		4a †		†	2 †	
M11	26	30	1a,1h,1c	2h	3h	14h,2f	†	3	11 †
M29	26	27	7f,9c	2a,1f,1o,9c	None	2a, o	8f,4a,7o	None	4
F7	31	28	3a,1c	4o,1f,1c	2o	†	†	2	†
M5	31	29	3a,1c	2a,1h,9c	None	1o,7f†	†	None	1 †
					Group II				
M20	37	36	5a,2f,1c	3a,9c	None	None	8a,2f	None	None
F16	39	43	1h	3h,1f,1a	13h	1a,7h	24h,1f,1a	13	3
M35	41	40	1o,1c	1h	None	3h	4h,1o	None	3
M30	42	42	1f,1h	1h,1o	1o,1h	1h	4h,2o,1f	1	1
M24	43	35	1a,1f,1c	2h,4f	1h	1o	3h,5f,1a, 1o	1	1
F4	45	32	1h	1h,1o	9h†	12h,2o†	3o †	9 †	11 †
F21	45	34	1o	2o,1f	2o	1o	6o,1f	2	1
M28	45	33	1o,1c	1f,1o,1c	1o	None	3o,1f	1	None
F32	46	43	1h	1h	None	6h	8h	None	6
					Group III				
M12	46	43	1h	2h	None	1h	4h	None	1
M3	47	47	1h,1c	1h	2h	9h		2	9†
M36	48	65	1h,1f,1c	2h	None	None	3h,1f	None	None
M40	49	42	1h	1o	8o	23o,2f ††	†	8	7††
F27	51	30	1h	1h	1h	1h	4h	1	1
F33	52	48	1a,1f,1o, 1c	1h	2f,4h	4h	9h,3f,1a, 1o	5	4
M18	54	42	1h	2h	7h	None	10h	7	None
F9	57	39	2f,1a,1c	1h	None	8h	2f,1a,9h	None	8

a = Retrace to entrance
c = Subject called
cg = Subject called and guided
f = Reëntry into blocked path
h = Entry into blocked path, then selection of adjoining path
o = Entrance into blocked path, then selection of nonadjacent path
† = Experiment discontinued before criterion was satisfied
†† = Called after seventh error trial, satisfied criterion in next four trials

and longer intervals between trials in order that this phenomenon might be more completely described.

Of the twenty-four children who continued in their efforts after the first block, seven, or 29 per cent, required zero additional error trials to satisfy the criterion. Their adjustment and subsequent selection of the new path was immediate, though subsequent trials in most cases were characterized by various degrees of misorientation to the old path, as was described in the discussion of experiment QC. It will be recalled that 57 per cent of the subjects in that experiment adjusted in zero error trials.

Nine other subjects required two additional error trials or less to learn a new path habit, thus sixteen, or 67 per cent, rapidly established new path habits. The same value for experiment QC was 83 per cent. When number of required trials is correlated with mental and chronological age, insignificant coefficients of -.02 are found in each case. Evidently here also other factors are operating in determining the rapidity of readjustment.

When the second blocked trial is considered, Table XI shows that nine of the subjects failed to satisfy the criterion. Six of these were from Group I, one from Group II, and two from Group III. Five of the youngest children failed because of refusal to make further attempts toward effecting exit. In general, two types of behavior were manifested: (1) poking at the curtains and retracing to the entrance with or without crying or other appeal for help, with no response when they were called by the assistant; (2) no direct attempt to effect exit with or without crying, playing with curtains, or thumb-sucking. For the first type of behavior insufficient intelligence is possibly accountable; for the second, inadequate motivation with or without sufficient intelligence. The experiment in each case was discontinued only when efforts failed to obtain further trials.

The behavior of the other subjects who failed to satisfy the criterion, M11, F4, F9, and M40, can be described in the same terms used for F4 who failed also to satisfy the first criterion. Their behavior appeared automatic, stereotyped. The experiment was discontinued after thirty trials with all except the last of these subjects to be used, M40. With him the assistant stood up behind the maze after the thirtieth trial and called as the subject entered the maze, telling him sternly to hurry. (Calling had not been previously resorted to if the subject proved himself able to reach the exit unaided.) He oriented immediately to the only open path on both this and the next trial on which he was called again. On the following two trials he took the same path without error. The question arises whether increased motivation served to interrupt this stereotyped or possibly perseverative behavior. Unfortunately, it cannot be answered from the present data.

Of the nineteen subjects who kept running after the second block, four, or 22 per cent, needed zero additional error trials to satisfy the criterion, while five took only one error trial. Thus nine, or 47 per cent, may be said to have rapidly set up a third path-selection habit. By inspection of Table XI, it will be seen that rapidity of learning after the first block was not prognostic of behavior after the second block. Again, correlations of number of required trials with mental and chronological age are insignificant, the former giving a coefficient of -.17 and the latter, .09. Other factors than age or level of intelligence are evidently operating.

When the type of errors is analyzed it is seen that here, as in experiment QC, errors of entering into blocked path then selection of adjoining path and of entering blocked path then selection of nonadjacent path are highest in frequency. Reëntry into the blocked path is seen to occur in the error behavior of every one of the younger subjects of Group I, in six of the nine subjects of Group II, and in four of the eight subjects of Group III. It will be recalled that it occurred in only the two youngest subjects of experiment QC. Frequency of the error retracing to the exit also decreases in a more pronounced degree with increasing age. It was found in all eight of the youngest subjects, in only three of the children in Group II, and in only two of Group III. Again the findings agree in trend with those of experiment QC. It may be concluded that retracing to the entrance and reëntry into the path which has just been discovered to be blocked are more typical of the younger than of the older subjects of this age range. Trial of another path subsequent to entrance into the blocked path is, in general, the most frequent type of behavior. As in experiment QC, the total number of errors made by these fifteen subjects who satisfied both criteria when correlated with mental and chronological age are seen to be unrelated to either age. The obtained coefficients are shown in

correlations of total errors (Table XII).

Further inspection of the same table shows no significant relationships between excess time on blocked trials and first trials after each block when uncalled cases are considered.[1] No relationships were shown on the same correlations for experiment QC. When called and uncalled cases are compared, significant differences do appear for both mental and chronological ages, as will be seen in Table XIII. It follows that those children who spent three or more minutes of ineffectual behavior in the maze, or who resorted to crying at being blocked, were significantly younger than those who successfully negotiated without aid each new maze situation. For the latter group the correlations do not show any relation between excess time and mental age, and little between excess time and chronological age.

When Figure 9 is again inspected the same time levels which were maintained over test and retest are, in general, evidenced by the three age groups for the blocked trials. Differences are obviously significant between the youngest and oldest groups, but not so apparent between the two older groups as would be expected from the correlations. It is shown that up to a certain critical age level younger children require more time, but over that age other factors seem to be largely responsible for the recorded differences.

A comparison between the portion of Figure 9 showing blocked trials and Figure 6 is of interest. The preschool children are seen to have adjusted to the first block situation much more rapidly than did the orphanage children. On the second block the preschool children are seen to compare quite favorably with the oldest group of experiment TC. Unfortunately the separate influences of previous maze experience and preschool environment cannot be factored out. The finding concerning excess distance remains to be considered. The technique by which it was determined in terms of equal units was described in the discussion of experiment BF. When the number of distance units used in excess of the number required for a direct errorless route is correlated with mental and chronological age (Table XII), significant relationships are found on each of the trials considered with the exception of the first trial after the first block. The older children are seen to have consistently used less excess distance in negotiating the blocked situations.[2]

The question remains, which is the more important factor, mental or chronological age? When each is held constant by means of partial correlation, it is shown by the following tabulation that mental age has been a factor only in so far as it has been related to chronological age. The correlations with mental age held constant are seen to be significant or to approach significance. While the findings are not conclusive, it seems possible to assume that chronological age is more closely related than is mental age in respect to excess distance.

Measures Correlated	r	n	P
Excess distance first blocked trial and chronological age (mental age constant)	-.3353	25	Between .1 and .05
Excess distance first blocked trial and mental age (chronological age constant)	-.0332	25	Greater than .1
Excess distance second blocked trial and chronological age (mental age constant)	-.3639	24	Between .1 and .05
Excess distance, first trial after second block and mental age (chronological age constant)	-.0707	24	Greater than .1
Excess distance first trial after second block and chronological age (mental age constant)	-.5462	23	Less than .01
Excess distance first trial after second block and mental age (chronological age constant)	-.1597	23	Greater than .1

1. Excess time on second blocked trial which gave the highest coefficients was subjected to partialing. When chronological age was held constant, the obtained coefficient was -.11; when mental age was held constant, the coefficient was -.32. Neither are significant.
2. Similar correlations for experiment QC (Table I) indicate only one agreement, where one significant relationship was found between excess distance on first blocked trial and chronological age. The obtained coefficient was -.75. Whether the general disagreement is the result of different populations or the result of small sampling cannot be determined here. For the present, the latter is the more plausible assumption.

TABLE XII

CORRELATION COEFFICIENTS FOR BLOCKED TRIALS FOR EXPERIMENT TC

	n	Mental Age		Chronological Age	
		r	P	r	P
Excess Time					
First blocked trial	8	.11	Greater than .1	-.08	Greater than .1
First trial after block	23	-.16	Greater than .1	-.14	Greater than .1
Second block	18	-.35	Greater than .1	-.45	Between .1 and .05
First trial after second block	18	.16	Greater than .1	.25	Greater than .1
Excess Distance					
First blocked trial	25	-.37	Between .1 and .05	-.48	.02
First trial after first block	25	-.09	Greater than .1	-.04	Greater than .1
Second blocked trial	24	-.42	.05	-.53	Less than .01
First trial after second block	23	-.58	Less than .01	-.72	Less than .01
Total Excess Distance					
To first criterion	24	-.26	Greater than .1	-.32	Greater than .1
To second criterion	18	-.19	Greater than .1	-.30	Greater than .1
Number of Trials					
To satisfy first criterion	23	-.02	Greater than .1	-.02	Greater than .1
To satisfy second criterion	16	-.17	Greater than .1	.09	Greater than .1
Total errors	15	.08	Greater than .1	-.13	Greater than .1

TABLE XIII

SIGNIFICANCE OF MEAN DIFFERENCES IN CHRONOLOGICAL AND MENTAL AGE FOR CALLED AND UNCALLED CASES

Age	Called Cases		Uncalled Cases		n	t	P
	Mean	S.D.	Mean	S.D.			
First Blocked Trial							
Chronological	3.01	.93	3.86	.36	25	6.060	Less than .01
Mental	2.83	.97	3.25	.42	25	2.852	Less than .01
Second Blocked Trial							
Chronological	2.66	.62	3.60	.79	24	5.355	Less than .01
Mental	2.43	.37	3.23	.83	24	4.662	Less than .01
First Trial After Second Block							
Chronological	2.10	.26	3.76	.57	23	12.070	Less than .01
Mental	2.02	.30	3.35	.67	23	8.190	Less than .01

SUMMARY

The results of the experiment with the triple choice maze may be summarized as follows:

1. Thirty-three of forty subjects were successfully used in this maze. Failure with seven subjects is attributed to a combination of inability to rapidly adjust to a new situation, insufficient motivation, and retarded or immature mental development. The youngest subject successfully used was twenty-two months in both mental and chronological age.

2. Twenty-nine, or 91 per cent, of the thirty-two subjects upon whom the results are based were constant in their path-selection behavior; three, or 9 per cent, were variable.

3. Twenty-two of the constant subjects, or 76 per cent, set up the path habit in one trial, five used two trials, one took three, and one four. Thus twenty-seven children, or 93 per cent, established a path-selection habit in two trials or less.

4. Twenty-one or 84 per cent, of the twenty-five subjects who were given retests trials selected the path most frequently taken on the previous test.

5. A tendency toward constant path-selection behavior was indicated in two of the three variable subjects.

6. The type of preliminary training in some cases determined the direction of first orientation in the maze. A right orientation is suggested by the behavior of other subjects which may be the result of direction orientation to the exit.

7. Thirteen of the subjects were called on the first maze trial due to crying or three minutes of ineffectual behavior. The number of calls shows significant correlation coefficients of -.67 with mental age and -.56 with chronological age. The called group was significantly younger in chronological age than the uncalled group. Mental age differences were not significant.

8. Greatest speed in the maze as measured by the least trial time recorded shows a significant negative relationship to both chronological and mental age, the correlation coefficient in both instances being -.48. Mean difference in this value between the oldest and youngest groups was also significant. The older children show greater speed.

9. Number of trials after learning which contained excess time show a significant correlation of -.43 with chronological age. The difference in means for this value between the oldest and youngest groups is also significant. If constancy of maze time is a criterion of constancy of motivation, the older children tended to be more constantly motivated. In general, motivation was satisfactory. Twenty-one subjects evidenced no excess time after learning, and six more showed two trials or less which contained excess time.

10. Time curves show differences between three chronological age groups. Sample analyses indicate that differences between the youngest and oldest groups are significant. The younger children consistently required more time and adjusted less rapidly.

11. When the path habitually selected by each of twenty-five subjects was blocked, twenty-three of them satisfied a new path habit criterion. Seven subjects required zero additional error trials; nine others required two or less additional error trials. Thus sixteen, or 67 per cent, rapidly established a new path habit. The remaining seven children used four to thirteen error trials. One child failed to satisfy the criterion in fifteen trials, due to stereotyped error behavior. Another resorted to crying upon being blocked.

12. When the new path also was blocked for twenty-four subjects, nine failed to satisfy the criterion for a new habit. Five of these subjects, the youngest, resorted to crying or refusal to continue in the maze. The other four failed because of stereotyped error behavior. Of the nineteen subjects who continued in their efforts, four needed zero additional error trials to satisfy the criterion and five took only one error trial. Thus nine, or 47 per cent, rapidly set up a third path-selection habit.

13. The most frequent type of error behavior was entry into the blocked path followed by trial of one of the other paths. Reëntry into the blocked path on the same

trial and retracing to the exit were found to be more typical of the younger subjects.

14. Number of trials or errors required to form new path habits after blocking show no relationship to mental or chronological age.

15. Excess time after blocking for subjects who were not called is unrelated to either mental or chronological age. When the subjects whom it was necessary to call are compared with the uncalled subjects, significant mental and chronological age differences are found, the called subjects being younger.

16. Excess distance used in the maze to form new path habits after the blocked trials shows a negative relationship to chronological age. The younger children used more excess distance in establishing new path habits.

GENERAL SUMMARY

Sixty-five young children ranging in chronological age from one year, zero months to four years, nine months and in mental age from zero years, eleven months to five years, ten months have been used in three body-maze experiments involving the use of three maze patterns. The experiments were conducted to determine the practicability of planning maze studies with young children and to discover whether children rapidly set up path habits in mazes which offer more than one path to the exit.

The first experiment made use of twenty-five preschool children in a small broken field maze, pattern BF. The second experiment used a quadruple choice maze, pattern QC, and fourteen subjects of the previous experiment. The third experiment employed a triple choice maze, pattern TC, and forty orphanage children. Separate summaries of results follow the individual discussions of the experiments. A brief recapitulation follows:

1. All of the twenty-five preschool children were successfully used throughout the experimental program, as were thirty-three of the orphanage children. Failure to use seven children is attributed to a combination of inability to rapidly adjust to a new situation, inadequate motivation, and immature or retarded mental development. The youngest subject successfully used was twenty-two months in both mental and chronological age. It would seem practicable, therefore, to plan maze studies with young children above this age. It is suggested that investigations which do not assume constant motivation as one of the experimental conditions will obtain more valid results.

2. The findings in regard to path-selection behavior are briefly presented in the tabulation on the following page. It will be seen that the majority of children manifested constant behavior which is defined as recurrent selection of the same path after its first use, if first use is not later than the fourth trial of the first test. A tendency for the variable subjects to be constant in behavior has been demonstrated. It must be concluded that the typical reaction of the young children used in these maze situations is constant path-selection.

3. The factors making for variability have been analyzed in so far as the data permit. It is concluded that inadequate motivation (manifested in slow maze behavior with many trials containing excess time) or comprehension of the maze situation resulting from previous maze experience, circumspection, or exploration are the conditions which result in variable path-selection behavior. Conversely, strong motivation or comprehension of only a part of the maze situation, due possibly to age under a certain critical level or to inexperience, seem to be the factors which predetermine constant behavior. (The youngest preschool child to show variable behavior was twenty-nine months chronologically and forty-one months mentally. The youngest orphanage child to show variability was forty-two months chronologically and thirty-five months mentally.)

4. It will also be seen that the majority of the constant subjects established path habits in one trial. A few required two trials, and only three needed more than two trials. Most of the constant subjects were found to reëxhibit the same path habit upon retest one week later. Five of seven subjects tested one month later still selected the same path. Abrupt drop in time curves

Type of Behavior	Experiment BF (n = 25)		Experiment QC (n = 14)		Experiment TC (n = 32)	
	Number	Per Cent	Number	Per Cent	Number	Per Cent
Subjects constant in path-selection behavior	16	64	9	64	29	91
Subjects variable in path-selection behavior	9	36	5	36	3	9
Constant subjects requiring one trial to establish path habit	11	69	11	100	22	76
Constant subjects requiring two trials or less to establish path habit	15	94	11	100	27	93
Constant subjects reëxhibiting same path habit on retest one week later	12	92	8	80	18	82

is further indication of the rapidity with which these children adapted to these maze situations.

5. When the exit was blocked in pattern BF and a new one opened which might be reached by a shorter route, eight subjects failed to shorten the route; instead they added a new segment to the old path. Seven subjects took the new and shorter route in from one to five trials. No subject shortened the route who had not exhibited exploratory behavior on the first blocked trial or previous to it. This was the only factor which seemed to bear a relation to this type of behavior.

6. When the path habitually taken in patterns QC and TC was blocked, the majority of the preschool subjects and many of the orphanage children rapidly established new path habits as will be seen from the following tabulation:

Since many of the subjects required zero additional error trials, learning of a new path-selection was often immediate. With one exception all of the preschool children succeeded in satisfying new habit criteria after each of three blocks. The one exceptional subject failed because of stereotyped error behavior. Six of the orphanage children failed to satisfy habit criteria after two successive blocks due to crying and refusal to continue in their efforts. All were in the youngest of the three chronological age groups. Four subjects failed due to stereotyped error behavior, which seems possibly to be the result of inadequate motivation.

7. Typical error behavior on blocked trials was entry into the blocked path followed by trial of one of the other paths. Reëntry into the blocked path on the same trial and retracing to the maze entrance

Subjects Requiring	Experiment QC			Experiment TC		
	n	Number	Per Cent	n	Number	Per Cent
No additional error trials to establish new path habit after first block	6	4	67	24	7	29
Two or less additional error trials to establish new path habit after first block	6	5	83	24	16	67
No additional error trials to establish new path habit after second block	6	2	33	19	4	22
Two or less additional error trials to establish new path habit after second block	6	5	83	19	9	47
No additional error trials to establish new path habit after third block	7	2	30			
Two or less additional error trials to establish new path habit after third block	7	5	70			

were typical of only the younger subjects. Crying necessitating calling was also typical of only the younger subjects.

8. As far as the data indicate, visual cues are most operative in this type of habit formation. The maze behavior of these young children was characterized by little locomotor exploration but by much visual exploration which decreased from trial to trial. The formation of new path habits after blocking was again accompanied by much visual exploration. On these trials, after actual elimination of errors had occurred, misorientation toward the previously taken path persisted in degrees varying from gross locomotor misdirection to slight misorientation of the head and eyes. This is construed as being further evidence that these path habits are set up largely in visual terms.

9. When all subjects are considered, time spent in these maze patterns bears little relation to either mental or chronological age. However, when extreme age groups are compared or when a group similar in maze behavior and experience is considered, time records are inversely related to chronological age and possibly also to mental age.

10. Number of trials or errors to satisfy habit criteria were found to bear no consistent relationship to either mental or chronological age. Excess distance used in learning a new habit seems to be negatively related to chronological age in experiment TC where successive blocked trials were conducted over a fairly wide age range. No consistent relationship was found in experiment QC. The relationship is largely to be attributed to the great amount of excess distance used by the younger of the orphanage subjects.

These data indicate that, above a necessary age minimum which varies according to the nature of the learning required, neither mental nor chronological age are factors which determine rapidity of learning in these types of maze situations. Individual differences in motivating conditions are suggested as being of greatest importance.

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